Interoperability
Can You Hear Me Now?

Break MT's Enigma Code!
Spy Games at the International Spy Museum
Reviews: Sangean WR-2, TenTec RX-340

AOR, the Authority on Radio Makes MORE Than Great Radios!

Discover *these* Accessories & *Add to your* Capabilities.

DA3000

SA7000

Antennas for the Great Outdoors

DA3000: a 16 element receive wideband discone antenna with useable frequency coverage from 25MHz to 2GHz. Using different length elements to ensure true wideband characteristics, the DA3000 also includes one 'loaded' element to enhance low frequency performance. Engineered and manufactured to AOR's exacting standards, the DA3000 comes with 50 feet of quality RG58/U coaxial cable terminated in a BNC plug for the radio connection and a low-loss TNC plug in the antenna base. Pole clamps are also standard.

Designed for areas where space is a problem or when an "unobtrusive" installation is essential, **SA7000** is a super wideband coverage receive antenna with useable frequency coverage of 30 KHz to 2 GHz. The SA7000 is a passive arrangement with two whip elements: a long element for short wave up to 30 MHz and a second shorter loaded whip antenna for frequencies up to 2 GHz. The loading coils are tuned around 150 & 800 MHz to enhance VHF & UHF performance.

Antennas for Indoor Enjoyment

AOR has made performance even better with the new **LA380** indoor antenna as successor to the popular LA350. The LA380 features full frequency coverage (40KHz – 500MHz) using a single receiving element. Designed to provide reception when away from the main monitoring location or when large external antennas are not practical, the LA380 is a compact active (1 foot diameter) loop antenna which features an internal high-gain amplifier (20dB for 40KHz-250MHz) and excellent overall strong signal handling (high IP3 +10dBm). The loop design allows directional control and nulling noise or interference. Perfect for listening in remote locations or in antenna-restricted areas.

LA380

Accessories for Added Monitoring Capability
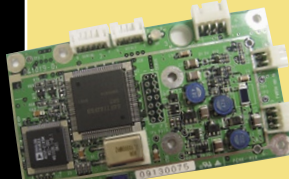
P25-8600 APC025 Decoder

Now you can monitor APCO 25 signals using an AR8600MKII. The **P25-8600 APCO25 Decoder** can be installed in the AR8600MKII receiver to automatically decode the APCO25 signal. The decoded audio is then output from the receiver's speaker. *(Installation is required.)*


TVA-1 External NTSC TV Converter

The **TVA-1 External NTSC TV Converter** is compact, lightweight and easy to install. Designed to be used with the AOR AR5000A series of communications receivers, its simple operation uses the 10.7 MHz IF input from your receiver. Audio and video outputs allow monitoring a variety of sources such as broadcast TV, public safety agencies, aircraft, Amateur Radio FSTV, news media video and more.

The **TV5000A NTSC TV Internal Converter** adds the ability to receive broadcast television signals (NTSC) and allow monitoring video feeds from a variety of sources including broadcast TV channels, public safety agencies, aircraft, Amateur Radio FSTV, news media video and more when used with AOR AR5000A series of communications receivers.

TV5000A NTSC TV Internal Converter

The **TV2000 External NTSC Video Decoder** is designed to be used with the AOR SR2000. Compact and lightweight, no external power supply is required (power is supplied from the SR2000). The video output is available from the rear panel of the TV2000 and audio is provided from the SR2000 through the external speaker jack.
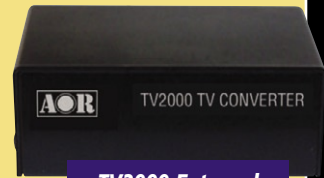
TV2000 External NTSC Video Decoder

For more great accessories, visit the website at www.aorusa.com.

A marine receiver like no other.

At WiNRADiO, the innovation never stops.
The new WR-G33EM model represents yet another breakthrough: the world's first PC-based marine receiver.

- Frequency range 9kHz to 30MHz
- AM, LSB, USB, DSB, CW conventional modes
- DSC, HF Fax, NAVTEX, TELEX marine modes
- Very high sensitivity
- Excellent dynamic range
- Real-time spectrum analyzer
- Spot-on tuning in 1Hz steps
- Continuously variable bandwidth 1Hz - 15kHz
- Automatic scheduling, recording and playback
- GPS option

A laptop controlling a WR-G33EM Marine Receiver

The WR-G33EM receiver easily outperforms a conventional receiver, thanks to advanced signal processing techniques making it possible to implement sharper selectivity filters with more accurate demodulators and decoders.

The USB-interfaced WR-G33EM receiver
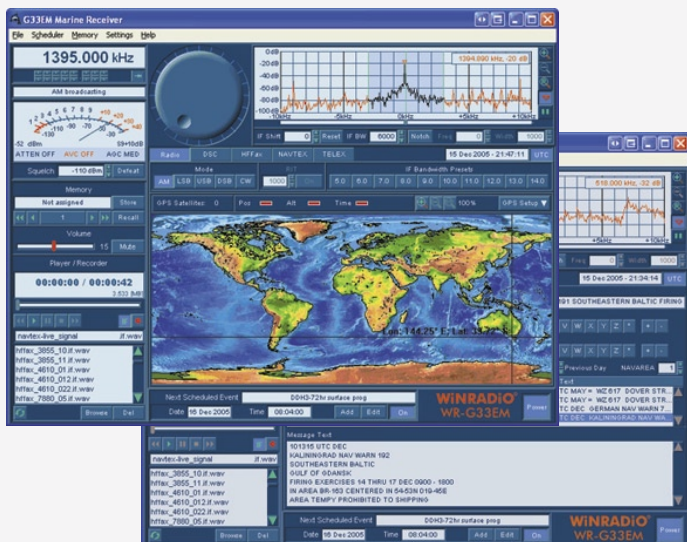
The WR-G33EM receiver offers far more features and facilities than a typical conventional receiver. For example, the real-time spectrum analyzer with continuously variable bandwidth, graphical notch filter and IF recording are just some of the many features which were previously unavailable on a conventional marine radio, in particular at such an affordable price level.

All decoding functions are seamlessly integrated with the receiver: Switching from classical AM or SSB modulations to receiving DSC, HF Fax, NAVTEX or TELEX messages is just one mouse click away.
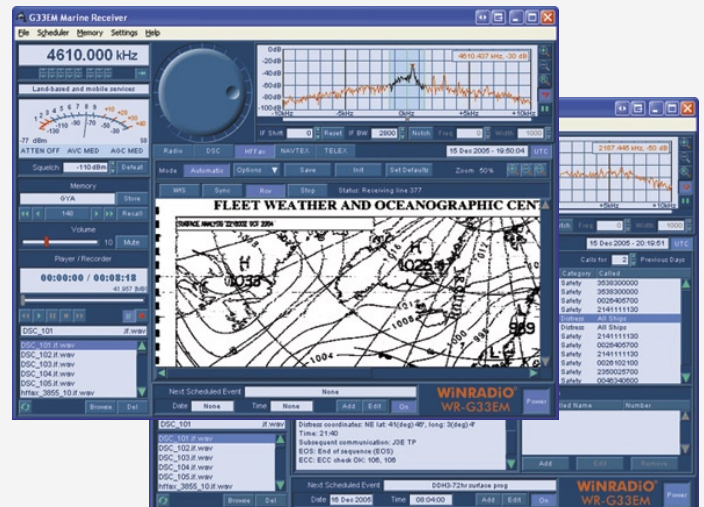
For more information about this remarkable receiver, visit:

www.winradio.com

...the future of radio. ™

Cover Story

Interoperability: The Real Story
By Larry Van Horn

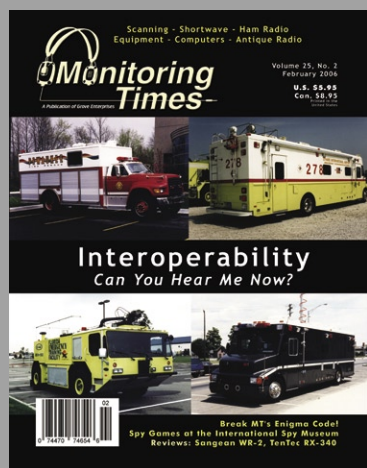To hear politicians and the media talk, you'd think interoperability is an unachievable goal because all available spectrum is taken and there won't be enough frequencies until the television stations give up their analog channels in the 700 MHz band.

We decided to investigate. In this article we have compiled a list of the frequencies already set aside for mutual aid and interagency operation in each band: We hope this foray into the real world will prove educational. (Story starts on page 10.)

On our cover: Cover photos by Garry Watts.

C O N T E N T S

Interoperability in New York City 12
By Hugh Bradshaw

One way to achieve immediate interoperability between non-compatible systems is by using equipment that interconnects all systems responding to an incident. The City of New York has ten such units, all housed in mobile communications or command vehicles so they can be deployed wherever needed.

Enigma 14
By John Catalano

The most famous coding machine in history, the Enigma machine provided extremely secure levels of message encryption for over 50 years by various militaries and government agencies. But the secret is out. Today, not only do we know how it works, but we can even download and run an Enigma simulator on our own computers. In fact, we have a special message from **MT** for you to decode!

The International Spy Museum 18
By Ken Reitz

Ever since balloons were used in America's Civil War to hoist a wired telegrapher to report confederate troop movements to Union generals, America has been at the forefront of communications and spying. The International Spy Museum (appropriately in the heart of Washington D.C.) displays the evolution of spy paraphernalia and gives visitors of all ages a lighthearted chance to try their own skills.

Reviews:

Sangean has followed the success of its WR-1 AM/FM (housed in a wooden case for better acoustics), with the **Sangean WR-2,** which adds the digital Radio Data System information stream to this attractive mid-priced receiver (see page 68).

The professional-grade **TenTec RX-340** HF receiver has been around for a few years, but it's new to reviewer Jim Clarke, who finds it lives up to its reputation (see page 70).

John Catalano reviews a couple of utilitarian software programs, both having to do with time. **RecAll-Pro** is sophisticated but very simple to operate and it can transform your listening style by allowing unattended recording so you are no longer chained to your radio. **ClocX** is a simple time/alarm system that can remain active within almost any Windows program. (See page 72.)

Have you wondered about the difference between FRS, GMRS and MURS radios in actual performance? Bob Grove pits three sets of radios against each other in his report on page 69.

Has the paparazzi gotten this desperate? Find out on page 18.

Re_Inventing Radio through Design and Necessity

FR250 $50*
Multi-Purpose

Stay informed and prepared for emergencies with this self-powered 3-in-1 radio, flashlight and cell-phone charger — no batteries required.

_ AM/FM/Shortwave Radio Reception
_ Built-in power generator recharges the internal rechargeable Ni-MH battery (Included)

_ Cell-phone charger output jack 3.5mm (various cell phone plug tips included)
_ Built-in 2 white LED light source and one flashing red LED
_ Dimensions: 6-1/2"W x 6"H x 2-1/2"D
_ Weight: 1 lb. 3 oz.
_ Power Source: Built-In Rechargeable Ni-MH Battery Pack; 3 AA Batteries (not included); Crank power alone; AC Adapter (not included); AC Adapter recharges built-in Ni-MH battery pack

FR200 $40*
Crank it Up

Without the need for batteries, this self-powered 2-in-1 radio and flash-light helps you stay informed and prepared for emergencies.

_ AM/FM/Shortwave Radio Reception
_ Built-in power generator recharges the internal rechargeable Ni-MH battery (Included)

_ Built-in white LED light source
_ 12 international bands
_ Dimensions: 6-1/2"W x 5-3/4"H x 2-1/4"D
_ Weight: 1 lb. 2 oz.
_ Power Source: Built-In Rechargeable Ni-MH Battery Pack; 3 AA Batteries (not included); Crank power alone; AC Adapter (not included); AC Adapter recharges built-in Ni-MH battery pack
_ Available colors: Metallic Blue, Metallic Red, Sand

FR300 $50*
All-In-One

This all-in-one unit offers func-tionality and versatility that makes it ideal for emergencies.

_ AM/FM/TV-VHF/NOAA Radio Reception
_ Built-in power generator recharges the internal rechargeable Ni-MH battery (Included)
_ Can be powered from four different sources:
  1. The built-in rechargeable Ni-MH battery that takes charge from the dynamo crank and from an AC adapter (AC adapter not included)
  2. 3 AA batteries (Not included)
  3. The AC adapter alone (AC adapter not included)
  4. The dynamo crank alone, even with no battery pack installed
_ Cell-phone charger output jack 3.5mm (various cell phone plug tips included)
_ Built-in 2 white LED light source and one flashing red LED
_ Weather alert
_ Dimensions: 6-1/2"W x 6"H x 2-1/2"D
_ Weight: 1 lb. 3 oz.

NOAA

S350 Deluxe $150*

High-Performance Field Radio with Stereo Headphones

For S350 devotees the deluxe model combines a sporty new exterior with the same unrivalled functionality.

_ Highly sensitive analog tuner with digital display
_ Large, full range speaker with bass & treble control
_ Clock, alarm, and sleep timer
_ Built-in antennas and connections for external antennas
_ Headphones included
_ Dimensions: 12-1/2"W x 7"H x 3-1/2"D
_ Weight: 3 lb. 4 oz.
_ Power Source: 4 D or AA Batteries (not included) or AC Adapter (included)
_ Available colors: Metallic Red, Black ■ ■

Improvements over S350:

_ FM- stereo via headphones
_ AM/SW Frequency Lock
_ Set clock and alarm while radio plays
_ Operates on 4D or 4AA batteries

S350 $100*
Ruggedly Retro

With the look of a retro field radio sporting a rugged body and military-style controls – the S350 also features today's innovation for excellent AM, FM, and Shortwave reception and a large, full-range speaker for clear sound.

_ AM/FM/Shortwave Radio reception
_ Highly sensitive and selective analog tuner circuitry
_ Liquid Crystal Display (LCD), for frequency and clock display.
_ Digital clock with selectable 12/24 hour format
_ Dimensions: 10-3/4"W x 7"H x 3-18-1/2"D
_ Weight: 3 lb. 2 oz.
_ Power Source: 4 D Batteries (not included) or AC Adapter (included)

YB550PE $100*
Digital expertise

Offering high-tech digital performance and portability, the YB550PE packs performance into a small radio. Palm-sized and only 11oz, the YB550PE can receive AM, FM, and continuous Shortwave across all 14 international bands.

_ Shortwave range of 1711 – 29,995 Khz
_ Autoscan, direct keypad, and scroll wheel tuning
_ 200 customizable station presets
_ Alarm and sleep timer functions
_ AC adaptor and supplementary antenna inputs
_ Dimensions: 3-1/2"W x 5-3/4"H x 1-1/2"D
_ Weight: 10.5 oz.
_ Power Source: 3 AA Batteries (included) or AC Adapter (not included)

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*Prices do not include Shipping/Handling and applicable taxes.
To order, please call us toll free at 1-800-793-6542

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www.etoncorp.com

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COMMUNICATIONS

Ham Broadcast Station

Although licensed for two-way radio communications, amateur radio operators are not allowed to engage in one-way broadcasting. But Mississippi's Hancock County Amateur Radio Association, with a great deal of foresight, got around that limitation when they established low power FM station WQRZ in 2003, operating at 100-watts. Following Hurricane Katrina, WQRZ(LP) was the only radio station based in the county that was on the air and still providing radio service and information specifically for county residents.

"This is exactly the reason why we put the station on the air in 2003. The concept was to put on a station with the intent to broadcast emergency information during emergencies," said Brice Phillips, chair of the Hancock County ARA board of directors. "This is exactly what radio is supposed to do, serve their communities."

It wasn't easy. Phillips had to move the station four times in order to keep it on the air, but the need for information was so great, local stations received a lot of support from outside broadcast suppliers and engineers. Harris Corporation, for example, offered turnkey installations, shipping pre-made shelters with transmitters and equipment pre-wired.

Local Hancock County emergency managers requested that Phillips seek a temporary power increase. Sara Allen, president of Ciara Enterprises Inc., a broadcast engineering consulting firm, said local emergency managers "needed a tool to communicate emergency rumor control, health and welfare information directly to the people of that county." She received Special Temporary Authority to raise the station's power to 4 kW. Although the antenna could only handle 1.3 kW, that was enough to cover the county at 103.5 MHz.

"I learned that good radio can be produced with minimal equipment and that desperate times call for desperate measures," Allen said.

As for the help Phillips received in the months following Katrina, he said, "We realized we were not in this alone. Hopefully this will inspire other folks in other communities that when you have to deal with man-made or natural disasters it can be done."

The Weather and More

A number of Florida communities are turning to low power FM for local weather announcements, evacuation information, and other emergency purposes. Barefoot Bay, Florida, uses WBFT-LP, 105.5-FM, broadcasting storm advisories and weather updates from the National Oceanic and Atmospheric Administration.

Residents in the hurricane-battered community said they want more avenues of communica-

tion for future storm seasons. The Association President said many residents missed key information about the evacuation for Hurricane Wilma, and some residents also missed a boil-water notice.

Broadwater County, Montana, has a new voice in emergencies. KDGZ (K-dogs), 98.3 FM, a low-power FM radio station at Broadwater High School, went on the air in December, thanks to a unique collaboration between the school district, local disaster and emergency services, and a telesystems expert.

Montana Disaster and Emergency Services provided the funding, estimated at about $40,000. Another key partner was Lee Good, who operates TeleSystem Services in Cardwell.

"I came up with the equipment package and the programming to get them on the air," he explained. He is helping launch about 25 rural low-power FM stations in Montana, including several operated by local emergency service departments. His system uses Internet to feed the program audio stream to the station, monitor the station remotely, and remotely control the transmitter equipment.

"The cost of the equipment is fairly inexpensive, 1/20th of the cost of doing it with microwave equipment," he said.

VDOT Looks to Higher Power

The Virginia Department of Transportation is awaiting a consultant's report on whether a higher-power AM or FM station would extend the range of travel warnings broadcast to drivers. VDOT already owns the Highway Advisory Radio, a network of six 10-watt transmitters that broadcast at AM 610 to a limited area of Hampton Roads, but with scratchy audio and spotty coverage.

Acquiring a more powerful station would extend the signal to portions of Willoughby in Norfolk, Isle of Wight County, southern Virginia Beach and Chesapeake, and the Eastern Shore, but it could be a multimillion dollar proposition.

Few state highway departments own radio stations outright, but in Delaware, commuters can tune into WTMC 1380 AM, an 800-watt station broadcasting traveler information day and night.

"The station is not that exciting, but if you're a commuter in Delaware, it's vital," said Darrel Cole, manager of public relations for that state's Department of Transportation.

Emergency Alert System

The FCC has asked for comments regarding the national alert and warning system. Since 1994, this function has been performed by the Emergency Alert System (EAS), which is jointly administered by the Commission, the Federal Emergency Management Agency (FEMA), and the National Oceanic and Atmospheric Administration's National Weather Service (NWS). The

FCC is proposing new rules which will expand the reach of EAS to cover digital communications technologies that are increasingly being used by the American public to receive news and entertainment – digital television and radio, digital cable, and satellite television and radio.

The FCC also seeks further comment on how to amend the EAS rules to ensure that EAS messages more effectively reach individuals with hearing and vision disabilities.

The Senate Commerce, Science and Transportation Committee has already put many of the same recommendations into a proposed Warning, Alert and Response Network Act. The bill, referred to the full Senate, will also establish a national tsunami warning system and help fund sirens and related equipment.

Congress Sets the Date

Under a compromise agreement, lawmakers set Feb. 17, 2009, as the hard date to complete the transition from analog to digital television. The deal also includes a $990 million subsidy to help consumers buy digital converter boxes.

High Definition Radio

In a rare example of cooperation, seven of the largest U.S. radio companies have formed a strategic alliance to coordinate the rollout of HD Radio in an effort to combat the growing popularity of satellite radio. HD Radio will not only improve sound quality, but it will allow broadcasters to expand programming with extra channels or streams of data, such as traffic and weather information.

At least for the first two years, Alliance members will offer these additional channels commercial-free, the group said, and it plans to coordinate programming formats to provide maximum diversity. The group expects to announce its first market-specific HD programming lineup early in this year.

So far, very few stand-alone HD receivers exist; the Alliance is putting its primary focus on vehicle manufacturers and the drive-time audience.

New P25 System at BWI

Motorola announced in mid-December that it has landed a $6.9 million contract to deploy a Project 25 trunked radio system at Baltimore/Washington International Thurgood Marshall airport. The system will be the first P25 system deployed in the state of Maryland, the company said.

Motorola Blocks RadioReference

Here's a curious item posted by Lindsay

Blanton at RadioReference.com:

"An anonymous source recently relayed to us that Motorola Inc is blocking all access from internal networks within Motorola to RadioReference.com because 'Many Motorola Public Safety customers have reported that the site provides information they consider proprietary and whose publishing potentially threatens their operations. Past actions by this site have proven to be counter to Motorola's ethics and business goals.'

"The anonymous source reports that a significant tool for frequency management, interference management, and system support... has been removed from use for Motorola employees.

"Also interesting to note is the fact that Motorola marketing officials use the database for their marketing acitivities (as indicated by a recent email to me from the Motorola marketing team), and a recent check showed that 67 people are registered users with email addresses from motorola.com.

"Things that make you go hmmmm..... (we are shaking our heads in amazement)"

RadioReference.com was the first recipient of *Monitoring Times'* Internet Excellence Award.

AMATEUR RADIO

ARRL Staff Member Dies

The American Radio Relay League Headquarters staff is mourning the loss of Senior Assistant Technical Editor Bob Schetgen, KU7G, of Glastonbury, Connecticut, who died unexpectedly December 5 at the age of 54. An ARRL Life Member, Schetgen had worked at Headquarters for nearly 23 years. He was perhaps best known as the editor of the "Hints & Kinks" column in *QST* and as managing editor of the League's technical and experimenter's journal *QEX*.

LETTERS TO THE EDITOR

Interoperability Issues

We received a lot of mail supporting Larry Van Horn's November editorial regarding interoperability and how non-compatible systems aggravated the problems caused by power outages in New Orleans following Katrina. Many folks hoped their state and local politicians would read it, and to that end, we have posted the editorial on our website in pdf format, together with blanket permission to copy and distribute it to whomever you think would benefit.

Emails of support were received from Jacques d'Avignon, Alan Bosch, Rick Herndon K5FNI, Brad Lorenzen N0HSN, Craig, KJS, Tom Marcotte N5OFF, Mac McCormick III KF4LMT, Ken Swanson, Peter Viscarola, a reader from New York, and others.

New Orleans and Finger-Pointing

An AP story by Matthew Fordahl was circulated on the *stupidscanningtricks* yahoo group. The article, entitled "U.S. Lacks Unified Emergency Radio system," concluded with these paragraphs:

"But system compatibilities in emergency communications alone cannot fairly be blamed for delays in rescuing the flooded or getting food or evacuation to stranded refugees.

"'The much-criticized federal response to Katrina shows that even the latest equipment is no guarantee of smooth communications,' said John Pike, director of GlobalSecurity.org.

"'They had all the radios in the world. They had complete interoperability,' Pike said of federal emergency officials. 'That was not a hardware problem. That was a people and procedure problem.'"

Reader Craig L. copied us on his thoughts regarding potential solutions to the communications problems enumerated in the above article. These included designing the system so critical infrastructure was located outside flood-prone areas, handing out extra radios to outside agencies to allow interoperability, using portable, self-contained repeaters to keep 800 MHz system functional, etc.

"What really surprised me was the comment made by one of the Coast Guard personnel, in which he said that the helicopters could not communicate with the ground (airboat) units because they lacked a common band to operate on. The Coast Guard does have

marine VHF channels (156-162 MHz) in all their vehicles, so how hard would it be to issue portables to the ground units? Or better yet, if any of the agencies on the ground are using VHF, why not just add some common channels to their radios for communications with the helos? Folks, this is not rocket science and it need not cost lots of money."

"...Alright so here we are, now what do we do? We turn to ham radio. Not for them to relay messages which we all know they do with great efficiency, but for something else pioneered by hams; cross-linking. Connect two or more mobile radios together to form a repeater that, for example, receives on 146 MHz (VHF) and retransmits that signal on 446 MHz (UHF). And it works in both directions! Now substitute 154 MHz VHF and 453 MHz UHF and you have a cheap solution to an emergency interoperability problem.

[*Ed Note: According to a FEMA memorandum, National Disaster Medical Emergency Teams are prohibited from using Amateur Radio Service, Family Radio Service, or General Mobile Radio Service communications equipment, because of compliance issues with HIPAA (Health Insurance Portability and Accountability Act).*]

"...Lastly, there are several manufacturers that have products in the market that allow radios to be crosslinked by simple plug-and-play setup. Any public safety official involved in emergency management, should consider acquiring appropriate radio gear for the purpose of crosslinking and have it available for any emergency where outside agencies might be involved, and as a backup to their own existing system, just in case... [*See our feature article on NYC's OEM vehicle - ed.*]

"There is no excuse for the apparent lack of communications after an emergency, as we have seen here with New Orleans. I know of small portable repeaters that can be connected to a mobile radio to provide intra as well as interagency communications; they run on 12 volt dc power and are the size of a briefcase and can be brought on line in under 5 minutes! Enough said."

A letter just received from Robert G Bailey Jr, Telecommunications Manager of Harrison County Emergency Communications Commission says much of the above was done... He listed 11 federal, state, and local agencies which already had EDACS radios assigned to them prior to the hurricane, and

many more were issued as needed as agencies arrived which had different systems.

"One of the biggest issues was the arrival of response teams without any knowledge of their available communications resources which required either a call back to their agency Communications Division or local technicians had to read radios and determine their resources. Either way, interoperability was achieved for everyone that responded and coordinated their communications needs through the Interoperability Command Post. This interoperability was accomplished in a number of manners which included, reprogramming responding agencies equipment to operate on existing infrastructure, utilizing their existing ability to access the national VHF frequencies, or in the case of the military and most federal agencies we issued them portable radios to operate on the HCECC EDACS radio system as they did not have any of the national mutual aid frequencies programmed in their radios. The bottom line is that the lack of a P-25 system did not impede interoperability with the assisting agencies. As a matter of fact P-25 CAI was never requested by single responding agency."

Robert G. Bailey Jr, Harrison County ECC

(Bailey's entire letter will be posted on the *MT* website.)

Dominic (Nick) Tusa K5EF of Tusa Consulting, New Orleans, was also intimately involved in how that city's public safety systems were set up. He wrote an article which details what worked and what failed in New Orleans; it is available on his website at **http://www.tusaconsulting.com/katrina-more.htm** and makes fascinating reading. He told *MT*, "...the fundamental cause of the communications nightmare in the Gulf Coast areas had nothing to do with proprietary radios. It was the lack of reliable electrical power and the inability of standby power systems (whose normal role is to sustain operations of a couple of days) to provide electrical service, continuously, for four or more weeks. Next in line was the short-sighted reliance by some agencies on leased telephone/T-1 circuits to interconnect distant transmitter/receiver sites to network controllers.

"...Last time I checked, there was no P-25 minimum specification for reliable electrical power systems and site interconnectivity to support these very complex communication infrastructures ...maybe it should be considered."

Not All APCO Systems Created Equal

"Let me start by giving kudos to the spirit of your above named editorial. You are entirely correct: There is no excuse for taxpayers funding radio systems that are not fully APCO Project 25 compliant. Spectrum is not the issue – Interoperability is the issue. Governments implementing systems that are not APCO P25 Common Air Interface (CAI) compliant are misguided and are not doing right by either themselves or their citizens.

"Having said that, however, I must also take you to task for not being sufficiently clear in your editorial regarding the meaning of P25 compliance. As I'm sure you know, full APCO Project 25 compliance requires adherence to the CAI, with a digital control channel operating at 9600bps. ...

"Many radio users, scanner listeners and professionals alike, are confused about what an APCO 25 system truly comprises. I think it's important for folks in the field, and especially those in the press, to use the proper terminology wherever possible to help reduce this confusion and ensure clarity. ...

"So, let's all get on the bandwagon and demand our governments implement new radio systems that comply with the APCO P25 CAI standard."

– Peter Viscarola, Mont Vernon, NH

Nick Tusa (see above) also disagreed with the editorial's assessment of system types, but the picture he paints is even more dismal in terms of compliance:

"There is not one fully-compliant 800MHz Project-25 digital trunked radio system, simulcast or single-site, operable anywhere within the State of Louisiana or Mississippi. The State Police operates a proprietary Project-16 Motorola Smartzone analog network. The various parishes and municipal police departments your editorial cited operate older proprietary analog Project-16 networks.

"... The only trunked system that is functionally equivalent to P-25 is the Jefferson Parish Sheriff Office's hybrid Smartnet-II infrastructure using the Astro IMBE digital vocoder. But that radio system is not P-25 compliant, as it uses Motorola's proprietary 3600 b/s control channel scheme. While digital, it is in fact an advanced Project-16 system as is the City of New Orleans, St. Tammany Parish and Harrison County, Mississippi – advanced in the sense that they use the newer IMBE vocoder for digitial voice operations.

"... Today, Motorola, EF Johnson and M/A-COM field competitive simulcast radio systems using P-25 technology. Proprietary systems are, thankfully, giving way and we will see true competition at P-25 similar to what users of conventional analog radio systems have enjoyed for decades...

"Your point should be that federal grants should be structured to allow existing system owners the ability to upgrade their infrastructure platforms to Project-25. Past grant opportunities have not allowed monies for upgrades to existing infrastructures, only for new radio devices. That is why you have not seen rapid conversion of proprietary Project-16 infrastructures to the desired Project-25 open standard. These conversions cost millions of dollars...where the federal grants often allow agencies to buy only a handful of radios.

"This funding approach will never get us to where we need to be."

700 MHz for the Birds

"Excellent editorial in the November issue of *MT*. You hit the nail on the head regarding the 700 issue. Why create a fifth public safety band when we can't even get the existing systems we have now talking together? Add LTR into the mix and the issue is ridiculous. I live in the Dallas/Fort Worth area and several public safety agencies have already made the switch to SMR LTR UHF systems.

"I just made a trip to New York City and they are no more prepared now for another 9-11 than they were then. I hate to think what would happen in our metroplex if we had a WMD or 'T' issue here. Keep beating the drum and preaching to the choir, someone important somewhere just might be listening."

- Mark Colborn, Sr.Cpl./Pilot, Dallas PD Helicopter Unit

In support of this month's article on interoperability frequencies, I'd like to reprint Nick Tusa's summary from his article on Katrina:

"In the aftermath of Hurricane Katrina, one casually observes far too much emphasis being placed on new frequency bands, modes and technologies. For example, some are calling on the urgent need for deployment of Project 25/700MHz radios within the New Orleans area. The idea being that the deployment of these new radios will somehow provide everyone...FEMA, State, Municipal, US Army, National Guard and others...the ability to communicate via a single radio. Yet, these military and federal agencies operate in radio spectrum assignments that are far removed and incompatible with public safety's 700/800MHz spectrum and the problem of unit-to-unit interoperability continues.

"A critical component for the successful deployment of public safety communications systems is careful planning. The three systems that survived Hurricane Katrina...St. Tammany, New Orleans and Harrison County... all required 12 to 18 months of study before design specifications were completed. And, each required two years to be fully implemented and functionally tested. By contrast, the State of Louisiana had, on September 5th, contracted Motorola, Inc. to design, furnish and install a three-site 700MHz trunked radio system for the New Orleans area in a scant 25 days.

"The fact that no 700MHz public safety radio systems exist anywhere in the nearby States of Texas, Arkansas, Louisiana, Mississippi or Florida and that no federal agency is currently operable on 700MHz immediately questions the ability of such a system to provide a measure of effective interoperable communications *with anyone*.

"... The blind pursuit of new technologies, devoid of network survivability planning, can only lead to renewed failures. This 90,000 square-mile disaster has no parallel in our nation's history. Let's take the necessary time to study all aspects of these failures, where fact-based decisions can be made that positively impact the operability and survivability of both existing and future public safety radio solutions."

– D. F. Tusa October 30, 2005

Interoperability: The Real Story

By Larry Van Horn, N5FPW
MT Assistant Editor

Public safety communications interoperability has been big catch word in the media lately in the aftermath of Hurricane Katrina. Politicians in Washington are pushing hard to move TV stations out of the UHF spectrum to establish a new 700 MHz interop band. If you believe the rhetoric from our elected officials in DC, there are no interop frequencies and we need the new 700 MHz band immediately.

What politicians are not telling you is that interop frequencies have already been set aside in each band. Nor do many taxpayers realize that, thanks to this new 700 MHz band, analog television sets will go the way of the musket and ball, and we'll all have to purchase a new digital television set or converter if we want to watch television.

We decided to investigate what the real world situation is, so we have compiled a list of nationwide VHF/UHF interop and mutual aid frequencies from official government sources, Association of Public-Safety Communication Officers (APCO) information, and Federal Communications Commission (FCC) rules and regulations.

In addition to our nationwide list, there are also local, regional and state frequencies set aside for inter-system, agency, and mutual aid channels throughout the nation. We have not included those in our list below, due to space constraints. But, as an example to illustrate our point, here are statewide mutual aid frequencies in Tennessee that are not on our nationwide list:

Statewide, Tennessee

154.7550	Law enforcement base/mobile <Law VMAD>	
155.2050	EMS base/mobile <EMS205>	
155.2800	EMS base/mobile <EMS280>	
155.2950	EMS mobile only <EMS295>	
156.0150	Law enforcement mobile only <Law VMA>	
159.7050	Tennessee Police/Fire/EMS/Medical Agencies interoperability <TNTAC>	
460.4000	Law enforcement base/mobile <Law UMAD>	
465.4000	Law enforcement mobile only <Law UMA>	

The VHF/UHF spectrum is loaded, not only with public safety interop frequencies, but with business itinerants, oil spill frequencies and emergency channels which are also available for multiple agency use. Again, due to space they are not listed in our frequency table which follows.

NATIONWIDE LISTINGS
Public Safety/Government Interagency/Interoperability/Itinerant Frequencies

27.5750 Simplex...............Government Itinerant, short distance, low-power service
27.5850 Simplex...............Government Itinerant, short distance, low-power service

39.4600 Base/Mob ....Law enforcement inter-system <3LAW-1>
39.4800 Base/Mob ....Fire inter-system <3FIRE-2> [Proposed]
45.8600 Base/Mob ....Law enforcement inter-system <3LAW-3>
45.8800 Base/Mob ....Fire inter-system <3FIRE-4>
47.4200 Base/Mob ....Special emergency, reserved for assignment only to national organizations eligible for disaster relief operations.
151.1375 Base/Mob ....Public safety (all agencies) interoperability, including local, state and federal agencies.<1TAC-5> <VTAC-1>
152.0075 Base/Mob ....Special emergency paging <1EMS-6>
154.2650 Mobile ....Fire inter-system<1FIRE-7>
154.2725 Base/Mob ....Fire inter-system <1FIRE-8>
154.2800 Base/Mob ....Fire inter-system <1FIRE-9>
154.2875 Base/Mob ....Fire inter-system <1FIRE-10>
154.2950 Mobile ....Fire inter-system <1FIRE-11>
154.3025 Base/Mob ....Fire inter-system <1FIRE-12>
154.4525 Base/Mob ....Public safety (all agencies) interoperability, including local, state and federal agencies. <1TAC-13> <VTAC-2>
155.1600 Base/Mob ....National Search and rescue Common, widely used but not an official allocation.
155.3400 Base/Mob ....Special emergency inter-system, Medical Hospital Emergency Ambulance Radio (HEAR) <1EMS-14>
155.3475 Base/Mob ....Special emergency inter-system <1EMS-15>
155.3700 Base/Mob ....Law enforcement mutual aid/inter-system, widely used but not an official allocation
155.4750 Base/Mob ....Law enforcement nationwide <1LAW-16>
155.4825 Base/Mob ....Law enforcement nationwide <1LAW-17>
155.7525 Base/Mob ....Public safety (all agencies) interoperability, including local, state and federal agencies. <1CALL-18> <VCALL>
157.2250 Mobile ....Public safety (all agencies) interoperability, selected inland US areas only <1TAC-21D>
157.2500 Mobile ....Public safety (all agencies) interoperability, selected inland US areas only <1TAC-19D>
157.2750 Mobile ....Public safety (all agencies) interoperability, selected inland US areas only <1TAC-20D>
158.7375 Base/Mob ....Public safety (all agencies) interoperability, including local, state and federal agencies. <1TAC-22> <VTAC-2>
159.4725 Base/Mob ....Public safety (all agencies) interoperability, including local, state and federal agencies. <1TAC-23> <VTAC-3>
161.8250 Base/Mob ....Public safety (all agencies) interoperability, selected inland US areas only <1TAC-25>
161.8500 Base/Mob ....Public safety (all agencies) interoperability, selected inland US areas only <1TAC-24>
161.8750 Base/Mob ....Public safety (all agencies) interoperability, selected inland US areas only <1TAC-26>
162.0875 Mobile ....Interagency Law Enforcement VHF Interoperability <1FCAL-35>
162.2625 Mobile ....Interagency Law Enforcement VHF Interoperability <1FLAW-36>
162.8375 Mobile ....Interagency Law Enforcement VHF Interoperability <1FLAW-37>
163.1000/168.3500 ....Government Itinerant, wide-area, common use repeaters
163.2875 Mobile ....Interagency Law Enforcement VHF Interoperability <1FLAW-38>
163.4250 Mobile ....Interagency Law Enforcement

VHF Interoperability <1FLAW-39>
163.7125 Simplex..............Government Itinerant, local-area, common use simplex
164.7125 Mobile ....Interagency VHF Incident Response <1FCAL-40>
165.2500 Mobile ....Interagency VHF Incident Response <1FTAC-41>
165.9625 Mobile ....Interagency VHF Incident Response <1FTAC-42>
165.5750 Mobile ....Interagency VHF Incident Response <1FTAC-43>
167.0875 Simplex..............Interagency Law Enforcement VHF Interoperability National Calling Channel <LE-A> <1FCAL-35D> (167.9 Hz PL)
167.0875/162.0875 ....Interagency Law Enforcement VHF Interoperability <LE-1> (167.9 Hz PL)
167.2500 Simplex..............Interagency Law Enforcement VHF Interoperability <1FLAW-36D/LE-6> (167.9 Hz PL)
167.2500/162.2625 ....Interagency Law Enforcement VHF Interoperability <LE-2> (167.9 Hz PL)
167.3250 Mobile ....Interagency VHF Incident Response <1FCAL-44>
167.7500 Simplex..............Interagency Law Enforcement VHF Interoperability <1FLAW-37D/LE-7> (167.9 Hz PL)
167.7500/162.8375 ....Interagency Law Enforcement VHF Interoperability <LE-3> (167.9 Hz PL)
168.1125 Simplex..............Interagency Law Enforcement VHF Interoperability <1FLAW-38D/LE-8> (167.9 Hz PL)
168.1125/163.2875 ....Interagency Law Enforcement VHF Interoperability <LE-4> (167.9 Hz PL)
168.4625 Simplex..............Interagency Law Enforcement VHF Interoperability <1FLAW-39D/LE-9> (167.9 Hz PL)
168.4625/163.425 ....Interagency Law Enforcement VHF Interoperability <LE-5> (167.9 Hz PL)
168.6125 Simplex..............Government Itinerant, local-area, common use simplex
169.5375 Simplex..............Interagency VHF Incident Response <1FCAL-40D/IR-5>
169.5375/164.7125 ....Interagency VHF Incident Response <NC-1 Calling>
170.0125 Simplex..............Interagency VHF Incident Response <1FTAC-41D/IR-6>
170.0125/165.2500 ....Interagency VHF Incident Response <IR-1>
170.4125 Simplex..............Interagency VHF Incident Response <1FTAC-42D/IR-7>
170.4125/165.9625 ....Interagency VHF Incident Response <IR-2>
170.6875 Simplex..............Interagency VHF Incident Response <1FTAC-43D/IR-8>
170.6875/166.5750 ....Interagency VHF Incident Response <IR-3>
173.0375 Simplex..............Interagency VHF Incident Response <1FTAC-44D/IR-9>
173.0375/167.3250 ....Interagency VHF Incident Response <IR-4>
173.6250/167.1375 ....Government Itinerant, local-area, common use repeaters
220.8025-220.8475 ....Public safety (all agencies) mutual aid (channels at 5 kHz intervals)
396.8750 Simplex..............Department of Defense Inter Squad Radios <Channel 1>
397.1250 Simplex..............Department of Defense Inter Squad Radios <Channel 2>
397.1750 Simplex..............Department of Defense Inter Squad Radios <Channel 3>
397.3750 Simplex..............Department of Defense Inter Squad Radios <Channel 4>
397.4250 Simplex..............Department of Defense Inter Squad Radios <Channel 5>
397.4750 Simplex..............Department of Defense Inter Squad Radios <Channel 6>
397.5500 Simplex..............Department of Defense Inter

Squad Radios <Channel 7>
397.9500 Simplex..............Department of Defense Inter Squad Radios <Channel 8>
398.0500 Simplex..............Department of Defense Inter Squad Radios <Channel 9>
399.4250 Simplex..............Department of Defense Inter Squad Radios <Channel 10>
399.4750 Simplex..............Department of Defense Inter Squad Radios <Channel 11>
399.7250 Simplex..............Department of Defense Inter Squad Radios <Channel 12>
399.9250 Simplex..............Department of Defense Inter Squad Radios <Channel 13>
399.9750 Simplex..............Department of Defense Inter Squad Radios <Channel 14>
407.5250/416.5250 ....Government Itinerant, local-area, common use repeaters
409.0500/418.0500 ....Government Itinerant, wide-area, common use repeaters
409.0750/418.0750 ....Government Itinerant, local-area, common use repeaters
409.3375/418.3375 ....Government Itinerant, wide-area, common use repeaters
409.9875 Simplex..............Interagency Law Enforcement UHF Interoperability <LE-16> <4FLAW-46D> (167.9 Hz PL)
409.9875/418.9875 ....Interagency Law Enforcement UHF Interoperability <LE-10> (167.9 Hz PL)
410.1875 Simplex..............Interagency Law Enforcement UHF Interoperability <LE-17> <4FLAW-47D> (167.9 Hz PL)
410.1875/419.1875 ....Interagency Law Enforcement UHF Interoperability <LE-11> (167.9 Hz PL)
410.2375 Simplex..............Interagency UHF Incident Response <IR-15> <4FCAL-52D>
410.2375/419.2375 ....Interagency UHF Incident Response <NC-2 Calling>
410.4375 Simplex..............Interagency UHF Incident Response <IR-16> <4FTAC-53D>
410.4375/419.4375 ....Interagency UHF Incident Response <IR-10>
410.6125 Simplex..............Interagency Law Enforcement UHF Interoperability <LE-18> <4FLAW-48D> (167.9 Hz PL)
410.6125/419.6125 ....Interagency Law Enforcement UHF Interoperability <LE-12> (167.9 Hz PL)
410.6375 Simplex..............Interagency UHF Incident Response <IR-17> <4FTAC-54D>
410.6375/419.6375 ....Interagency UHF Incident Response <IR-11>
410.8375 Simplex..............Interagency UHF Incident Response <IR-18> <4FTAC-55D>
410.8375/419.8375 ....Interagency UHF Incident Response <IR-12>
412.8250 Simplex..............Government Itinerant, wide-area, common use simplex
412.8375 Simplex..............Government Itinerant, wide-area, common use simplex
412.8500 Simplex..............Government Itinerant, wide-area, common use simplex
412.8625 Simplex..............Government Itinerant, wide-area, common use simplex
412.8750 Simplex..............Government Itinerant, local-area, common use simplex
412.8875 Simplex..............Government Itinerant, local-area, common use simplex
412.9000 Simplex..............Government Itinerant, local-area, common use simplex
412.9125 Simplex..............Government Itinerant, local-area, common use simplex
413.1875 Simplex..............Interagency UHF Incident Response <IR-13> <4FTAC-56>
413.2125 Simplex..............Interagency UHF Incident Response <IR-14> <4FTAC-57>
414.0375 Simplex..............Interagency Law Enforcement UHF Interoperability National Calling Channel <LE-B> <4FCAL-45D> (167.9 Hz PL)
414.0625 Simplex..............Interagency Law Enforcement UHF Interoperability <LE-13> <4FLAW-49> (167.9 Hz PL)
414.3125 Simplex..............Interagency Law Enforcement UHF Interoperability <LE-14> <4FLAW-50> (167.9 Hz PL)
414.3375 Simplex..............Interagency Law Enforcement UHF Interoperability <LE-15> <4FLAW-51> (167.9 Hz PL)
419.1875 Mobile ....Interagency Law Enforcement UHF Interoperability <4FLAW-47>
419.2375 Mobile ....Interagency UHF Incident Response <4FCAL-52>
419.4375 Mobile ....Interagency UHF Incident Response <4FTAC-53>
419.6125 Mobile ....Interagency Law Enforcement UHF Interoperability <4FLAW-48>
419.6375 Mobile ....Interagency UHF Incident

Response <4FTAC-54>
419.8375 Mobile ....Interagency UHF Incident Response <4FTAC-55>
419.9875 Mobile ....Interagency Law Enforcement UHF Interoperability <4FLAW-46>
453.2125/458.2125 ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4CALL-27D> <UCALL>
453.4625/458.4625 ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4TAC-28D> <UTAC-1>
453.7125/458.7125 ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4TAC-29D><UTAC-2>
453.8625/458.8625 ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4TAC-30D> <UTAC-3>
458.2125 Mobile ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4CALL-27>
458.4625 Mobile ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4TAC-28>
458.7125 Mobile ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4TAC-29>
458.8625 Mobile ....Public safety (all agencies) interoperability, including local, state and federal agencies. <4TAC-30>
460.5250/465.5250 ....Public safety (all agencies) inter-system/intra-system
460.5500/465.5500 ....Public safety (all agencies) inter-system/intra-system
462.9500/467.9500 ....Medical Hospital to paramedics base/mobile <Med 9>
462.95625/467.95625 ......Medical Hospital to paramedics base/mobile <Med 91>
462.9625/467.9625 ....Medical Hospital to paramedics base/mobile <Med 92 >
462.96875/467.96875 ......Medical Hospital to paramedics base/mobile <Med 93> <EMS UTAC>
462.9750/467.9750 ....Medical Hospital to paramedics base/mobile <Med 10>
462.98125/467.98125 ......Medical Hospital to paramedics base/mobile <Med 101>
462.9875/467.9875 ....Medical Hospital to paramedics base/mobile <Med 102>
462.99375/467.99375 ......Medical Hospital to paramedics base/mobile <Med 103>
463.0000/468.0000 ....Medical Hospital to paramedics base/mobile <Med 1>
463.00625/468.00625 ......Medical Hospital to paramedics base/mobile <Med 11>
463.0125/468.0125 ....Medical Hospital to paramedics base/mobile <Med 12 >
463.01875/468.01875 ......Medical Hospital to paramedics base/mobile <Med 13>
463.0250/468.0250 ....Medical Hospital to paramedics base/mobile <Med 2>
463.03125/468.03125 ......Medical Hospital to paramedics base/mobile <Med 21>
463.0375/468.0375 ....Medical Hospital to paramedics base/mobile <Med 22 >
463.04375/468.04375 ......Medical Hospital to paramedics base/mobile <Med 23>
463.0500/468.0500 ....Medical Hospital to paramedics base/mobile <Med 3>
463.05625/468.05625 ......Medical Hospital to paramedics base/mobile <Med 31>
463.0625/468.0625 ....Medical Hospital to paramedics base/mobile <Med 32 >
463.06875/468.06875 ......Medical Hospital to paramedics base/mobile <Med 33>
463.0750/468.0750 ....Medical Hospital to paramedics base/mobile <Med 4>
463.08125/468.08125 ......Medical Hospital to paramedics base/mobile <Med 41>
463.0875/468.0875 ....Medical Hospital to paramedics base/mobile <Med 42 >
463.09375/468.09375 ......Medical Hospital to paramedics base/mobile <Med 43>
463.1000/468.0000 ....Medical Hospital to paramedics base/mobile <Med 5>
463.10625/468.10625 ......Medical Hospital to paramedics base/mobile <Med 51>
463.1125/468.1125 ....Medical Hospital to paramedics base/mobile <Med 52 >
463.11875/468.11875 ......Medical Hospital to paramedics base/mobile <Med 53>
463.1250/468.1250 ....Medical Hospital to paramedics base/mobile <Med 6>
463.13125/468.13125 ......Medical Hospital to paramedics base/mobile <Med 61>
463.1375/468.1375 ....Medical Hospital to paramedics base/mobile <Med 62 >

463.14375/468.14375 ......Medical Hospital to paramedics base/mobile <Med 63>
463.1500/468.1500 ....Medical Hospital to paramedics base/mobile <Med 7>
463.15625/468.15625 ......Medical Hospital to paramedics base/mobile <Med 71>
463.1625/468.1625 ....Medical Hospital to paramedics base/mobile <Med 72 >
463.16875/468.16875 ......Medical Hospital to paramedics base/mobile <Med 73>
463.1750/368.1750 ....Medical Hospital to paramedics base/mobile <Med 8>
463.18125/468.18125 ......Medical Hospital to paramedics base/mobile <Med 81>
463.1875/468.1875 ....Medical Hospital to paramedics base/mobile <Med 82 >
463.19375/368.19375 ......Medical Hospital to paramedics base/mobile <Med 83>

800 MHz National Interop Frequencies

In accordance with the National Plan for 821-824/866-869 MHz, interoperability among federal, state, and local governments during both routine and disaster operations will take place primarily on five common channels in the following configurations:

821.0125 Mobile .... National Public Safety nation-wide mutual aid <8CAL-90>
821.5125 Mobile .... National Public Safety nation-wide mutual aid <8TAC-91>
822.0125 Mobile .... National Public Safety nation-wide mutual aid <8TAC-92>
822.5125 Mobile .... National Public Safety nation-wide mutual aid <8TAC-93>
823.0125 Mobile .... National Public Safety nation-wide mutual aid <8TAC-94>
866.2125/821.0125 ... National Public Safety nation-wide mutual aid <8CAL-90D> <8Call>
866.5125/821.2125 ... National Public Safety nation-wide mutual aid <8TAC-91D> <8TAC-1>
867.0125/822.0125 ... National Public Safety nation-wide mutual aid <8TAC-92D> <8TAC-2>
867.5125/822.5125 ... National Public Safety nation-wide mutual aid <8TAC-93D> <8TAC-3>
868.0125/823.0125 ... National Public Safety nation-wide mutual aid <8TAC-94D> <8TAC-4>

800 MHz Statewide Frequencies

In addition to the above frequencies, civilian agencies may permit federal use of a non-federal communications system. Below is a sample list of four states' statewide 800 MHz tactical frequencies:

853.3875/808.3875 ... Florida Mutual Aid Channel
866.2000/821.2000 ... California CLEMARS <Channels 20/21>
866.2250/821.2250 ... South Carolina statewide tactical <SCTAC-1>
866.6875/821.6875 ... South Carolina statewide tactical <SCTAC-2>
866.9125/821.9125 ... California FIREMARS-2
867.7750/822.7750 ... South Carolina statewide tactical <SCTAC-3>
868.5125/823.5125 ... California CLEMARS <Channels 8/9>
868.6375/823.6375 ... South Carolina statewide tactical <SCTAC-4>
868.7875/823.7875 ... Colorado statewide base-base/base-mobile/mobile-mobile <STAC-5>
868.9750/823.9750 ... South Carolina statewide tactical <SCTAC-5>
868.9875/823.9875 ... California FIREMARS

In closing, we reiterate the statement made by David Boyd of the Homeland Security Department to a congressional sub-committee, that people, not technology, create the greatest obstacle to achieving interoperable communications. As we can see above, frequencies are already available: We respectfully submit that agencies should quit squabbling and use them!

Interoperability in New York City

OEM's Interagency Communications Vehicle

By Hugh Bradshaw

Communications Coordinator
New York City Office of Emergency Management

The city of New York currently has an Interagency Communications Committee that meets once a month. This committee consists of representatives from Dept of Information Technology and Telecommunications (DOITT), Office of Emergency Management (OEM), Police Dept (NYPD), Fire Dept (FDNY), Port Authority of NY and NJ, State, County and Federal entities, and representatives from bordering states and counties.

Through this committee, ten TRP-1000 interoperability units have been distributed to a diverse group of agencies. The committee has also agreed on a programming template for the TRP-1000 units, so that they are capable of specific interoperability frequencies before an event occurs. All of the agencies that have the TRP-1000 units have them in mobile communications and/or command vehicles.

The City of New York Office of Emergency Management's Interagency Communications Vehicle (ICV-1) is a 1994 Ford F-350 diesel truck with a type 1 wheeled coach ambulance body. This vehicle was added to the OEM fleet in October of 2003. It was formerly an FDNY ambulance that was assigned as part of their

reserve fleet. Most of the work to transform this vehicle into the interagency communications vehicle was done by OEM staff.

The ICV-1 is equipped with a suite of communications equipment that includes VHF, UHF, 800 MHz radios as well as Nextel and cellular phones, a radio scanner, a TRP-1000 Interoperability unit, and radio battery chargers, all mounted in the rear work area. The ICV-1 is designed to support on-scene communications for response personnel. Although interoperability is a major focus, it is by no means the sole purpose of the vehicle.

The communication equipment in the ICV-1 can be powered by several different sources. Two 2000 watt inverters power all the AC equipment from the alternator of the vehicle. A 2000 watt Honda gasoline generator is also kept onboard as a redundancy if the inverters should fail or the vehicle needs to be shut off. The AC power lines on the inverters can also be disconnected and extension cords run from a power source to power the equipment.

The ICV-1 is equipped with a TRP-1000 interoperability unit. The TRP-1000 system configuration that NYCOEM utilizes provides total system provisions for field or base station

requirements. The system allows radio networks of different frequencies to communicate with each other via an ACU-1000. The TRP-1000's modular design is configured with a variety of radio types and ACU-1000 modules to conform to our mission requirements. The ACU-1000 allows interconnections, in any combination, between the system's ten radios and two phone lines. The ACU-1000 allows radio users on two separate frequencies to talk to each other, or a telephone user to communicate with a radio network.

This system consists of two transportable cases. The primary case houses the ACU-1000, two radios, a radio power supply, and interconnect panels to interface the primary case to the outside world and to the secondary chassis. The secondary case contains eight additional radios,

radio power supplies, and interconnect panels. The device also consists of a laptop computer and special software to control the system, interconnect cables, and RF output cables.

Currently the ICV-1 is equipped with several roof mounted antennas for the vehicle radios. Three of the roof mounted antennas are dedicated to the TRP-1000 interoperability unit. Three portable tri-band antennas on tri-pods are also carried to be deployed for use with the TRP-1000. A cable reel with 300 feet of cable and an assortment of cables for portable radios is also available to enable the TRP-1000 to be used below grade.

In addition to the extensive communications capabilities of the ICV-1, it also serves as a response support vehicle. It is equipped with rain gear, work gloves, rubber gloves, respirators, flashlights, flares, light sticks, scene lights, tool kit, a 12 foot collapsible ladder, helmets, Tyvek suits, hearing protection, eyewash, drinking

water, and batteries. A well equipped trauma bag and oxygen, as well as two fire extinguishers are on-board in the event the ICV-1 operator comes upon an emergency or one of our employees needs assistance during an operation.

The ICV-1 is designed to be a quick response communications and scene support vehicle. It requires training to learn how to utilize the equipment, but it is relatively easy to operate and requires no special licensing. It can take almost any route to an incident without height concerns or weight restrictions. Once at the scene of an incident it is small enough to maneuver around the scene, leaving the much larger Inter-agency command center-1 and the mobile data center somewhat further back from the scene. Necessary information can then be relayed back to the ICC-1 and/or MDC as needed by the ICV-1.

Frequency Interoperability

In addition to the TRP-1000 units, New York City currently has six interops frequencies in the UHF band. These frequencies are open to public safety agencies that are members of NY-MAC (The New York Metropolitan Area Committee on Spectrum Relief). There is currently a plan in place to make these frequencies more accessible to agencies in outer counties and in New Jersey, thereby expanding interoperability capabilities in the New York City Metro Area.

Citywide interops	482.6875	110.9 PL
Queens interops	482.8125	167.9 PL
Staten Island interops	482.8375	186.2 PL
Manhattan interops	482.7125	123.0 PL
Bronx interops	482.7375	136.5 PL
Brooklyn interops	482.7875	151.4 PL

There is a tactical channel that is available to the NYPD and FDNY specialized units that are required to work together in certain situations. This channel provides direct communications to members of each agency while allowing them to utilize their current hardware.

Tac U	460.4875	241.8 PL

DOITT recently issued Inter-Ops radios to FDNY, NYPD, and OEM with only the NY-MAC frequencies and a tactical frequency programmed into them.

Finally, let's not lose sight of the basics: Technology is great and is more than necessary; however, nothing takes the place of individual agency commanders at a unified command post speaking to each other and exchanging information, face to face.

The Most Famous Coding Machine in History

By John Catalano
All figures from "The History of Enigma" CD by T. Perera

A few years ago I was walking through the local hamfest. This has become a two-day semiannual ritual for me and my long time friend and colleague, Harve (HP for short). Suddenly I heard some noise that took me back a few decades. It was the unmistakable sound of an Enigma machine in operation. As I ran off in the direction of the clacking, HP wondered what great bargain I had spied and tried to keep up with me.

Eventually I stopped under a tent and front of a glass showcase. It was full of operating Enigma machines of just about every vintage, from the World War II German Army original to a Russian Cold War version!

Tom Perera, the owner of the tent, greeted me with a "Do you know what you are looking at?" I said "Yeah, Enigma, over fifty years of cipher technology."

Long before digital computers or PCs were ever conceived, a form of electronic message encoding was being used by governments around the world. Although more electromechanical than electronic, it provided extremely secure levels of message encryption that was used for over 50 years of war and cold war by various militaries and government agencies. From the 1920s through the Cold War of the 1960s, the Enigma message encoding/decoding device was a key element of governments' secure radio traffic networks.

Initially using Morse code and voice, then teletype, and later even burst transmissions, Enigma machines were used to stop "prying" ears from understanding government secrets.

What exactly was this Enigma machine? Who invented it? How was it used and by whom?

Figure 1 - Commercial offering of a version of the Enigma machine in the 1920s.

We'll try to answer these questions, shed light on some of the mystery surrounding Enigma, and even try a PC based Enigma simulator in this article.

Enigma Legends

World War II Enigma stories abound. The breaking of the German Submarine Enigma code broke the stranglehold that the Wolf Pak subs had on shipping traffic in the North Atlantic. Interception and decoding of the German Army General's plans for battle allowed the Allies to counter his moves before he made them. But the most often quoted story is concerning Winston Churchill.

The legend goes that Churchill felt that the breaking of the German Enigma code was so critical to winning the war that he protected that information at *all* costs. The story goes that, even though the Allies had decoded Enigma messages and learned that a large air attack was about to be staged on the English town of Coventry, he took the very hard decision of not using the information to send any added defenses to Coventry.

He concluded that if he did anything out of the ordinary, German intelligence agents would be alerted to the fact that Enigma had been broken. Therefore he had to stand by and let Coventry be bombed with a devastating number of civilian casualties. The sacrifice of Coventry may have resulted in the Allies winning the war. That's how important the Enigma machine was in WWII.

What's an Enigma?

The dictionary definition of enigma, "a baffling and inexplicable situation or person; a mysterious riddle," pretty well describes the feelings of allied military radio monitors listening to German transmissions in the years leading up to World War II. None of the Morse code messages made any sense. This is what a typical message yielded:

U6Z DE C 1510 = 44 = EHZ TBS =

QBLTW LDAHH YEOEF PTWYB LENDP MKOXL DFAMU DWIJD XRJZ=

To shortwave utility monitors, the pattern of blocks of five letters will look familiar. But what does it all mean?

One method of encrypting messages is the "One Time Pad." This uses a printed decoding book in which each page uses a different means of alpha-numeric transposing and manipulation. So, if the sender and the receiver use the same page for encoding and decoding, the message will start in plain language and end in plain language. However, in between encoding and decoding, it will appear as gibberish.

The One Time Pad works quite well for many clandestine situations, especially in a one-on-one environment. That is, until a "pad" falls into the wrong hands. Then, with code breaking knowledge, perseverance, and luck (lots of luck), the messages can be decoded and compromised.

Now add the complexities of a network environment – for example, a headquarters command issuing orders to many field units. Getting the pads distributed on a regular basis to all the units is a logistical nightmare. Now, consider the regular distribution problems associated with units operating in remote locations or a fleet of submarines. Clearly, the one-time-pad has major problems in these scenarios.

An Electrical Solution

World War I proved to be a deadly classroom for the governments of the world. The slaughter and senseless trench warfare resulted in development and refinement of a number of technologies. With the widespread use of wired Morse code transmissions and rapidly developing wireless communications, the need for secure message methods became critical.

During WWI and the years that followed, four inventors in German, USA, Netherlands and Sweden simultaneously, but independently, conceived of the idea for a code machine. Its defining idea seems to have come from the concept of connecting two electric typewriters together. However, Arthur Scherbius, a German, was the first to patent the contraption that became known as the Enigma machine. This technology was to become the cornerstone of the German forces' coded messages during World War II and many countries' security agencies in the 20th century.

Having suffered defeat in WWI, perhaps Germany felt the need to actively pursue all forms of message encryption for use by government diplomatic agencies and their decimated military before many other nations did.

However, governments were not the only markets Scherbius envisioned for his code machine. By the mid 1920s his German-based company was marketing a commercial version of the code machine for companies to protect transactions and finances from their competition. See Figure 1. With a few additions, the basic layout and operation of this machine is common to most Enigma machines manufactured for the next four decades, through World War II and even the Cold War.

Whirling Dervishes

A later (circa 1944) and more advanced Enigma machine is shown in Figure 2. This is a German Navy (Submarine) Four-Rotor Enigma Machine, the pinnacle of code machines used dur-

ing WWII by Germany. Looking closer at Figure 2, we can see that the physical construction of the Enigma machine consisted of four sections: rotors, display lights, keyboard and a plugboard. Let's go over each of the components and how they were used during encoding and decoding messages. Then we'll look at how these mechanical and electrical components interacted to do the ciphering job.

As the letter keys on the keyboard are pressed, the rotors spin or rotate into different positions; hence their name. A myriad of constantly changing electrical connections is made by the contacts on the flat of the rotor. If you look at the ad for the commercial Enigma in Figure 1, you can see a box of two rotors on the right.

The three rotors' shiny edges can be seen installed in the machine at the top of the panel in Figure 2. The fourth rotor, a black rotor, can be seen to the left of the shiny rotors. This four-rotor Enigma machine was considered by the German military to be unbreakable – an erroneous and costly assumption.

Figure 2 - The pinnacle of ciphering equipment, the German naval four-rotor Enigma machine circa 1944.

The rotor setup was one of the elements which contributed to Enigma's high level of security. First the operator had to know which rotors were being used. This information was defined in a setup configuration or key. By war's end, up to seven different rotors were available. Rotors were numbered and differed mechanically by their gearing and by the position of the index symbol (usually letters of the alphabet) on the rotor. Electrically, they varied in their contact points.

Once the correct rotors were selected, their relative placement in the machine's four rotor positions needed to be installed by the operator.

Internal Settings

Each rotor had an internal ring-setting number from 1 to 26. This setting determined when in its rotation the rotor would increment the rotor to its left. The internal ring setting of each rotor was another part of the machine set-up.

Finally, each rotor's "Start" letter had to be set correctly as per the key. In the code business, more combinations equals more security. You can see the huge number of combinations that are possible using these operator-controlled rotor variables.

Plug & Play

The plugboard was the next part of the Enigma that had to be set to the correct configuration. The plugboard, seen in Figure 3, is a group of numbered terminals, each of which accepts one end of a jumper block. The set-up code required the operator to set a number of jumpers between terminals. These plugboard combinations added to the huge number of possible rotor combinations and gave the four-rotor enigma machine combinational possibilities in the tens of millions or more, assuring the high level of security.
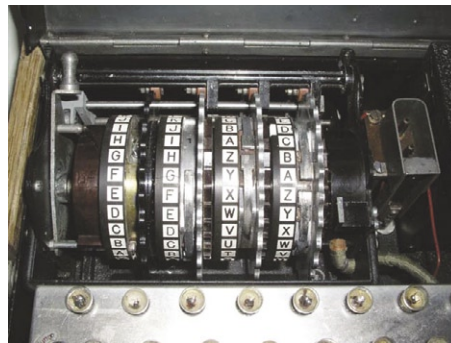
Figure 3 - Enigma's plugboard – Even more variables for the enemy to contend with.

The Key

Clearly, the Enigma machine's set-up configuration, or key, is critical. A number of methods of defining this were used, depending on the level of security required and the field situation of the units in the communications net.

In one scenario, headquarters transmitted a message on a regular schedule that dictated the specifics of the set-up configuration. Another mode had the configuration information transmitted before the message in a standard "set-up" code header. Alternatively, the Enigma machine's configuration could be set via a pre-arranged method, which may have been a function of the exact message date, day, or hour, or a combination of all three.

However, in most cases, due to the uncertainty and chaos of battle, each Enigma operator was given a super secret codebook that contained set-up Keys based on date. This was to be one of the chinks in the armor of Enigma, which led to its compromise by the Allies.

Encoding and Decoding

For encoding a message, once the operator had set up his Enigma machine's rotors and plugboard, it was just a matter of typing a letter of the message and seeing which letter light lit up. In the manual of most machines, each coded letter was then written down on a message pad to form a coded message. The procedure was repeated for each letter in the message. Once completed, the Enigma encoded message was then sent using Morse code over a CW (continuous wave) signal

or via landline.

Decoding was simple once the receiving Enigma machine's rotors and patchboard were configured correctly. Then all the operater had to do was to punch the letters of the coded message into the keyboard and write down the letters whose corresponding lights lit up.

Peeking Inside Enigma

In its simplest form, the Enigma machine lights a letter when a key is pressed. The trick is, how does it pick which letter to light? This where the encryption comes in; it is a complex result of all of the key settings and the configurations of the rotors and plugboard that we just covered. Figure 4 is a simplified circuit diagram of Enigma. Keep in mind that Enigma is very much like a VCR. Its operation cannot be totally defined by its electronics alone, since it is a mixture and interaction of electrical and mechanical devices.

We can see from the top portion of this drawing that the rotor connections are really the heart of the Enigma machine. With their huge number of electrical and mechanical combinations, the four-rotor machines have lots of different electrical combinations resulting in many, many different paths between the keys and the lights. The plugboard interconnection patterns add even more complexity and security.
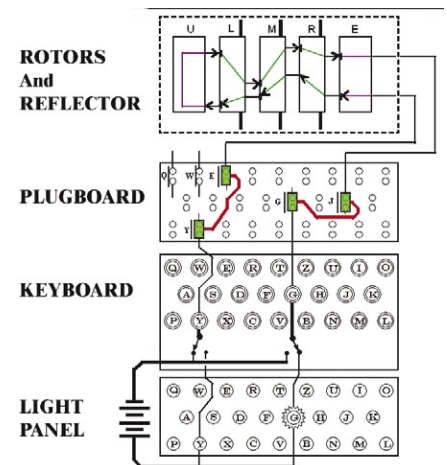
Figure 4 - Simplified circuit diagram of Enigma drawn by Jim Jaeger.

Let's Use an Enigma Machine

Yes, you can. Just use the Enigma simulator included on Tom Perera's CD referenced at the end of this article, or download one free from **http://w1tp.com/enigma/EnigmaSim.zip** (More about this fascinating web site later.) This program will run on just about any PC running Windows 98 or later. The 2.7 Meg program downloads, unzips and installs easily using WinZip. Figure 5 is the result: a real, live, four-rotor, *fully functional* Enigma machine.

Let's set up the machine to a specific key, which we'll create. Then I'll end with a message that you can decode.

First, we need to select the rotors and their order, and adjust the ring settings. Hover the cursor over a blank area near the rotors and a "hand" will appear. Left clicking opens the cover to the rotor compartment. Now we can see the rotors installed in the machine and the ones in a storage

Figure 5 - The Advanced Enigma Simulator. Fully functional!

Internal Ring Setting

Clicking on a rotor in the machine displays the rotor in a flat position in the center of the screen as seen in Figure 6. Here we are displaying rotor "II" denoted by the label at the top of the rotor. We can set the internal ring for this rotor by clicking in its center. Here we have chosen "E-05" as the internal ring setting. By moving each rotor to the center of the display its internal rings can be set. Now use the Internal Ring settings in our key chart to set your Enigma machine.

When all the rotors are in place, close the top by left clicking on the handle to the left and above the "B" reflector.

Start Settings

Once the cover is closed, the machine will look like Figure 5 again, displaying the four rotor letter windows. The "letter" in each window is set to the required letter by left clicking above or below the wheel to the letter's right. Set these, *starting again from the right of the machine,* to N W V A. Remember, that's starting from the rightmost letter window of the Enigma machine.

Plugboard & We're Ready

Now, hover your cursor at the bottom of the machine on the top view of the keys. Left clicking when the "hand" is displayed will display the Plugboard, Figure 7. Click on the terminals indicated on our key chart above. Do it in the order indicated.
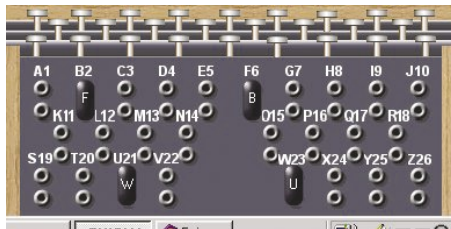
Figure 7 - The plugboard display with our "key" jumpers in place.

Left click at the very bottom of the machine and a window will open. As you enter letters, it will display the letter entered and the corresponding coded (or decoded) letter.

You have set up your first Enigma machine. I hope it's correct. In wartime it could mean the difference between life and death. But for now it may be the difference between winning or losing a prize.

I've taken some liberties to make the decoded plain text a bit easier to understand; however, this is not in keeping with the actual format used by German Enigma operators during WWII. Use the key set-up chart above and decode this sequence:

GOPK PPUR RHRX URAB LNED DCQT WWIQ EGVK YNWX NEVH NZPM UIOA

The first person that emails the correctly decoded message to *johncatalano@monitoringtimes.com* gets a six month subscription to *Monitoring Times*!

Honorable Mention

Although Arthur Scherbius received the pat-

case that are available but not in use. Left click on a rotor position to remove the current rotor from the machine. Click on the box to "store" the rotor.

Click on a rotor in the box and then click on an empty position in the machine to install it. Start with the "Reflector" at the far left. This is not a rotor, but a connecting ring that has a unique connecting scheme. We will use "B" Reflector.

Here is our Key. Position 1 is at the far right of the machine:

Position	1	2	3	4
(Position 1 is at the far RIGHT)				
Rotor Number	V	II	VIII	Beta
Internal Ring	Y25	E05	A01	Q17
Initial Start Letters	N	W	V	A
(Right to Left on Machine)				
Plug Settings & Order	B2	F6	W23	U21

Notice that in position 4 we do not use a normal rotor. The 4th position does not rotate and is populated by either a special Beta or Gamma rotor.

Figure 6 - Setting the rotor's internal ring.

ent for the Enigma, that did not stop other countries from developing their own code machines based on Enigma. The Swedish inventor Arvid Gerhard Damm filed his patent after Scherbius. His design was the basis of the C-36 Cipher Machine, granddaddy of the M-209. This was the mainstay of the American and British forces in WW-2. It has been said that the M-209 was never successfully decoded by the Germans.

Sources and Resources

Professor Tom Perera lives Enigma machines and knows just about everything there is to know about them. Much of the material in this feature and all the figures are from Tom's CD "The Story of the Enigma (Version 2)," available from his web site **http://www.w1tp. com/ecds.htm**. This CD is filled with Enigma history, technology, and lots of photographs. If you are interested in Enigma machines, military equipment, or the field of encryption, you *must* own this CD. As an insight into history, the full story of the development of a technology, and the details of the machine that changed the course of World War II, this $15 CD is well worth the price*. Version 3 is now available.

Another great Enigma site is **http://www. xat.nl/enigma/**. Here you can download a number of different Enigma simulators as used by various countries. At this site there are also simulators which run under operating systems other than Windows.

* *The Story of the ENIGMA: History, Technology and Deciphering* CD is $ 15 plus $3 shipping in the U.S. by check or money order to Artifax Books, 151 Barton Road, Stow, MA 01775. (Foreign buyers $15 plus $5 in US funds for Air Mail). Or order via Pay Pal at *artifaxbooks@yahoo. com*

Editor's Note:

For an in-person look at Enigma and the evolution of modern cryptography, why not visit the experts? The infamous National Security Agency maintains a National Cryptologic Museum which is free to the public and is located adjacent to NSA Headquarters at Ft. George G. Meade, Maryland. Check **http://www.nsa.gov/museum/** or call 301-688-5849 for hours of operation.

The International Spy Museum:

Spying and Communications in America

By Ken Reitz
All graphics courtesy International Spy Museum

Ever since balloons were used in America's Civil War to hoist a wired telegrapher to report confederate troop movements to Union generals, America has been at the forefront of communications and spying. And, at no time had the subject captured the public's imagination and the government's funding as during the Cold War. The peak period during the l960s spawned dozens of movies and TV series ranging from the gritty big screen realism of "The Spy Who Came in from the Cold" to the absurd TV comedy of "Get Smart."

America's participation in the "dark arts" began before the birth of the nation itself. General George Washington used invisible ink to add secret military commands to otherwise innocuous letters. Thomas Jefferson invented a hand held cypher wheel with which he could send coded messages. By World War I, telegraph and radio telegraphy figured heavily in America's spy activities, but it wasn't until WWII that America became obsessed with learning the secrets of its enemies. First, it was rooting out stateside Nazi saboteurs; later there was the Red Scare with secret cells of Communists seemingly ensconced in every part of America's waking and sleeping life.

The history of espionage in America is well told in the exhibits of this countries' only museum dedicated solely to spying: The International Spy Museum located in the heart of the District of Columbia at 800 F Street NW.

DIY Spy Training

The International Spy Museum is wildly popular, and most days you'll need advance reservations to tour the private, three story, storefront museum directly across the street from the National Portrait Gallery. The $14 ticket attempts to give the tourist a glimpse into the life and training of a secret agent. It aims to appeal to the spy in all of us, gives us five minute training seminars in lock picking and how to use disguises; lets us eavesdrop on fellow museum visitors via hidden microphones throughout the museum; lets us look at actual spy satellite images and zoom in on anything of interest.

We are asked to memorize personal data for our own "cover" persona. Later we'll be able to test our memories against a computer generated interrogation. Posters of staged ordinary looking street scenes are presented and we are asked to explain the spy activities actually happening. (It's revealed that we aren't nearly as paranoid as we should be. It turns out that everyone on the pictured street is a spy!)

Progress of Technology

Anyone interested in communications will enjoy viewing the numerous displays of spy paraphernalia. The bulk of the military displays feature items used in WWII, including miniature (for those days) tube-fired, crystal-controlled transmitter/receivers with tiny code keys to be used by military spies dropped behind enemy lines. Cold War era items abound, including a Soviet microphone/transmitter surreptitiously fitted inside the target's shoe heel. It's hard to imagine the effectiveness of such a device, but one does imagine it was bound to cause consternation at Langely, the CIA's well known HQ, as worried Cold Warriors decried the "shoe" gap.

KGB issue transmitter in the heel of a shoe circa 1960s.

Among the other eavesdropping treasures is a real potted plant "bug." (Finally bringing to reality the old gag, "Just speak into the potted plant."); an outrageously obvious "buttonhole" camera on a tweed coat which must have been great fun to wear during D.C.'s famously hot summers; a heavy leather briefcase packed with listening and recording devices; and the ubiquitous phone tap.

Displays from the '70s, '80s and '90s showed the real gains in spy technology, ranging from miniature still cameras to even more miniature video cameras; from small hidden microphones to amazingly small microphone/transmitters. On display were old Hallicrafters radios just like the ones used by Nazi fifth columnists to tune in secret HF messages from *Der Fuhrer* during WWII and Bearcat scanners just like the ones used by D.C. based KGB operatives to eavesdrop on our FBI.

There's not much in the way of current spy technology, but one display shows a mannequin seated on a bench with a normal looking athletic bag on its lap. There was nothing unusual about it and I began to wonder what it was purporting to show. Then I noticed a color monitor above the display on which I saw my own live image.

Bloody History/Fun 'n' Games

The International Spy Museum can't quite figure out if it's supposed to be funny or serious, so it's both. Found here on display is the Aston Martin DB5 motorcar driven by none other than James Bond, old "007" himself. There are large posters of John Steed and Emma Peale of the '60s tongue-in-cheek TV spy show *The Avengers*; there is a fake duct into which children are encouraged to climb and spy on their parents through fake duct vents. The noise of the kids tromping through the metal duct and shrieking with laughter makes it hard for those of us trying to hear the lock picking seminar for the second time.

Lipstick Pistol.

CIA tree stump listening device

What's Missing

While there are a number of well set-up displays to depict WWII era shortwave espionage activities, there was nothing about the HF "numbers" stations which kept many an *MT* reader glued to the well known spy frequencies and was the stuff of the very popular *MT* column on clandestine radio written by "Havana Moon." There was nothing on the infamous "Radio Swan" or "Radio America," which figured in our never-ending intrigue with Cuba and which has been replaced by the more up-front Radio Martí still ceaselessly jammed by Castro.

There was an extensive exhibit concerning the notorious Aldridge Ames affair, whose treachery is said to have resulted in the death of an untold number of CIA operatives. But there was no mention of the fiasco surrounding U.S. intelligence or lack of it in the run-up to 9/11. If nothing else, that alone serves to show that, despite its cut and dried appearance, espionage work is hit and miss. And, regardless of the tuxedo wearing, martini sipping, well coifed appearance of Hollywood spies, real spooks are often the least savory people, recruited from the ranks of criminals whose loyalties are fleeting.

Different Times, Same World

In today's sophisticated world dominated by the triumph of IC technology in communications, it's laughable to look at tube fired "secret" transmitters which needed a foot locker in which to be concealed and worked a radius of only a few miles. Most grade school children carry more sophisticated devices today in their pockets.

There's the mock-up of the office where the head of Stalin's secret service is said to have interrogated and dispatched hundreds of spies, real and imagined, to the Gulag or the firing squad. There's a special video presentation which shows that spies who are caught don't get to write their memoirs or become movie consultants. They get the chair, the firing squad or are hung, but only after being tortured.

During one presentation we see lovable cartoonist Walt Disney testifying before the House un-American Activities Committee in the '50s, declaring that suspected spies should be shot, not tried. Meanwhile, we're urged to sign our children up for a fun-filled slumber party at the museum.

In fact, ordinary communications today more closely resembles the far out spy gear depicted in the old 1966 TV series *The Man From U.N.C.L.E.* With wireless laptops, e-mail, Blackberry personal PCs, cell phones with video screens, satellite phones, you'd think spying would be easier now than ever before. But, just because the information can move faster and in greater data chunks, doesn't mean it's worth any more than an old fashioned film camera strapped to a pigeon. Governments around the world seem to be just as perplexed as ever about what's really happening today.

The Inevitable Souvenir Shop

Like any good museum, the International Spy Museum sports a well stocked shop with an assortment of souvenirs. Among my favorites was a rubber stamp which stated "This Document Doesn't Exist." I bought the ceramic mug with the catchy museum logo on it and a secret message in cypher which is revealed when you fill it with hot coffee.

But, you don't have to visit the museum to get some great spy memorabilia. Just go to **http://www.spymuseumstore.org** and shell out big money for a Limoges "Spy Box" regularly priced at $100; a KGB flask, for those all-night stakeouts at the Georgetown Metro stop is just $24 (BYO vodka); be the life of your next Politburo party with a fake potted fern camera for $295; and there are dozens more. You can also order their print catalog on-line and sign up for International Spy Museum e-mail "briefings."

For more information, visit the International Spy Museum web site: **http://www.spymuseum. org**.

The PRO-95, AM DX, and Two Antennas

MT *is a magazine for active radio enthusiasts and its readers have both questions and answers regarding all aspects of the hobby. Here are some recent examples directed to this column.*

❖ Deaf PRO-95

In the November *Beginner's Corner* I related the lament of an *MT* reader who was having trouble getting his PRO-95 scanner to hear anything. After reading some of the many comments posted on *eham.net* it was clear that he wasn't alone. Since I didn't have any experience with that particular scanner ,my advice was to check out *eham.net*, check with Radio Shack customer service and also the *MT* chat room at the *MT* home page. There were two responses from other readers with additional advice and comments.

MT reader Larry, from Maine, writes, "...I have had a similar experience with the Pro-2018 – it is lousy. I wrote via email to the company without any response. I even brought it up with the local RS store but they offered nothing. I paid $80 for it over a year ago ... I have yet to be able to listen to it ... Unless we're willing to sink our money into RS's more expensive scanners we will have to go with other [brands] ...at least I will never buy another scanner from RS."

Mike, KA3JJZ, from Glen Burnie, MD, is an *MT* reader and links editor for Capitol Hill Monitors as well as wiki administrator for *Radioreference.com*. He says consumers should do their homework. "...Time and time again I've seen complaints about not hearing anything with a (put in your favorite) scanner and not knowing a thing about what they're doing." Mike has several tips on finding information about scanners and their operation.

"RadioReference.com (**http://www.radioreference.com**) is a superb place to check the databases. Avoid using Betty Bearcat, etc.; by and large these are nothing more than FCC data dumps and not always very accurate or up to date. RadioReference has a team that keeps their databases up to date... RadioRefer-

ence now has an extensive wiki section with pages on most of the popular scanners out there. These pages often contain Yahoo groups (where the scanners are discussed in depth), Eham reviews, mods (if available) software, there's lots on each page..."

And, Mike points out, "...there's another use for Yahoo groups. Many geographic areas now have dedicated Yahoo scanner reflectors. One of the best places to get info is from people who live there."

❖ DX on the AM Band

MT reader Kelli writes: "I'm new to this whole shortwave thing. What I'm looking to do is listen to some Indianapolis radio stations, mostly AM, from my home in Michigan. I purchased the Grundig 100PE from Radio Shack, but have no idea how to find the Indianapolis stations, or if it's even possible."

Well, Kelli, the stations you want to listen to will most likely be found on the AM band, so having a shortwave receiver won't help. The problem is that during the day the AM signals may not be strong enough to get to your home in Michigan and at night they may skip over you. Also, many AM stations reduce their power at night, so you may not be able to receive them anyway. Still, it's worth a try.

It's doubtful that you would be able to receive Indianapolis stations via the FM band, because that band tends to be "line of sight" reception. Reliable distant reception on the

Terk AM Advantage is a great way to tune in to AM DX stations. It's inexpensive, easy to use, and looks good too! (Courtesy: Ccrane)

FM band is limited to 150-200 miles depending on your receiver, antenna and terrain. The 100PE does receive the AM band, so you may have some luck trying to tune in Indianapolis stations if you use a separate AM antenna such as the Terk AM Advantage. It's an inexpensive loop antenna sold through many outlets, including C.Crane and Amazon.com. I found the Amazon price was the cheapest ($33.79).

To use this antenna all you have to do is place it near the 100PE and tune the radio to the desired frequency and turn the tuning knob on the antenna for strongest signal. It doesn't need to be connected to the radio, just near where the AM antenna is. The advantages to this type of antenna are that it's inexpensive, sensitive, small and easily adjusted. You can also physically turn the antenna in different directions around the radio for strongest signal or to "null" out unwanted signals nearby.

Once you have your "listening post" set up, you'll have to know where to tune. There are several sources for lists of local AM radio stations. The all-time best is the official AM web page at the FCC (**http://www.fcc.gov/mb/audio/amq.html**). This is the AM Query page where you can look up all the info you need on any AM station in North America and the Caribbean. In the field where it asks for a city, just type in the target city – in this case "Indianapolis." All the other fields are filled in for this band-wide search. Just click on the "submit" bar and within a few seconds all of the stations licensed to that city will be shown. Details on frequency, power, operating hours etc. will be listed.

❖ A Shortened Beverage

MT reader Alvin Dattner writes: "... Because I live in a community governed by a home owner's association I'm unable to erect an antenna that would be visible from the street. As an alternative I placed about 100 feet of an end fed antenna about 4-inches above the cinder block walls around part of our lot. If I add additional feet (about 150) and terminate it with a resistor to ground, will this in any way duplicate the advantages of a modified non-directional Beverage antenna?"

To re-cap for those beginners not familiar with the Beverage antenna, here are the basics: It's a very long wire antenna erected only about six or eight feet high. The

antenna should be in a straight line with no sharp bends. It should be a continuous piece of wire (not spliced). If you want it to be directional in the direction it's pointed, then you can terminate it at the far end with a 450 ohm resistor to a ground. If you leave it unterminated, it acts as a bi-directional antenna in both directions in which it's laid out.

A Beverage antenna works best when it's at least one wave length of the target frequency. Let's say you're trying to tune in WCBS-AM New York (880 kHz). That's roughly 340 meters (λ=299792458/f) or 1,115 feet long. Well, who has that much room to play with? So, Alvin, like the rest of us, will have to do the best he can with what he's got. I've used a terminated 300-ft Beverage and was thrilled to be able to receive long wave broadcasters from France and Morocco.

A Beverage antenna is typically 450 ohms and you can feed it with 50 ohm coax into your listening post by using a 9:1 balun. There should be a ground at the balun end as well. Stranded wire for a Beverage may be purchased at any of the usual radio outlets, but for really long runs of wire consider getting electric fence wire at your local Tractor Supply Co. You can get a 9:1 balun for $34 from Industrial Communication Engineers Ltd. It has taps for 300, 450, 600 and 800 ohm antennas. You can call them at 800-423-2666 or visit **http://www.iceradioproducts.com/reconly.html#Beverage%20Matching**.

Feed your Beverage! This 9:1 Balun is for Beverage antennas with 4 taps for different impedances. Transforms your Beverage antenna to match 50 ohm coax. (Courtesy: Industrial Communication Engineers)

❖ An All-Purpose All-Band HF Antenna

Byron, KB6NOI, writes, "...I like to listen to many frequencies, AM, SSB, Utility and so forth. I have plenty of room to make a dipole, so, with what I've told you, what do you think would be the best length of the side for my new antenna?"

Here's an antenna that works great and one that I've been using since 1988 as my main AM and HF listening and HF transmitting antenna. It was designed by *MT's* Bob Grove and is based on the long-popular Windom and G5RV designs (see drawing). It's an off-center fed dipole 134-ft long with one leg 44-ft and the other leg 90-ft in length. The two are joined by a Hy-gain center connector and fed with 48.5-ft of 300 ohm flat TV twin lead, which is connected to terminals on a 4:1 balun to which the coax going into your shack is attached.

It's cheap, easy to build, relatively small, very sensitive, low noise and an all around great performer. I've worked the world (including Antarctica) with this antenna on

Tunerless All-Band Dipole. It's quiet, cheap, easy to build and a great performer. What more could a ham or SWLer ask?

all modes. It works 80-10 meters with no outboard tuner needed with a 2:1 VSWR. It will load up on the WARC bands (30, 17 and 12 meters) with an outboard tuner; however, it's not intended for 160 meter work. I've coaxed mine to load up on 160 and worked into Canada with it, but you really need a better antenna for 160.

I've only got it up 30 feet high and use it for 80 meter ragchewing or 20 meter DX hunting. It would work even better at 60 feet, but that height is not usually an option for most of us, so just drape the excess flat lead over to a nearby tree to get it out of the way. My experience with this antenna is that it has the lowest VSWR at the low end of the bands (the CW portion), but that also makes it an excellent performer for the digital modes (BPSK31 and RTTY). (You can read more about this antenna at **http://www.monitoringtimes.com/html/mtswlprimer3.html)**

If you're having trouble finding the parts for this antenna, here's where to go: You'll find the Hy-Gain center insulator at the Hy-Gain web site for $29.95. **http://www.hy-gain.com/products.php?prodid=C-1** The Van Gorden 4:1 balun is found at Amateur Electronic Supply (800-558-0411) for $18.99. Both the center insulator and the Van Gorden balun may also be found at Durham Radio (888-426-1688). Both AES and Durham Radio carry the necessary wire and end "egg" insulators to complete the project.

Van Gorden 4:1 balun for the all-band tunerless HF antenna. (Courtesy: Durham Radio)

Hy-Gain C-1 Center Insulator for the off-center fed all-band HF antenna. (Courtesy: Durham Radio)

ASK BOB

Digital Correction

In our December issue, I mistakenly said that all 2.4 and 5.8 GHz cordless phones were digital. Sharp-eyed reader Scott Ramage pointed out that he has one of these phones and it's analog! Shoppers should check the specifications for any new cordless phone to be sure it's not analog, but digital for maximum security.

Scott suggests that *MT* do an article on the vulnerability of new technologies to snooping, including these higher-frequency cordless phones, video baby monitors and wireless computer links. That's an excellent idea, way overdue considering how rapidly modern technology overtakes consumer education. Thanks, Scott. Any readers who are qualified or equipped to do such testing are invited to write to *editor@monitoringtimes.com*

Q. *For scanner listening, I have a magnetic base mounted on top of a filing cabinet with the scanner's original rubber duckie antenna plugged into it, but signals are weaker. What could be wrong? (Gary Kinsman, email)*

A. Although the magnetic base, cable or connector could be defective, it's also possible that there is a directional effect or signal acquisition problem at the location. Try putting the duckie back on your scanner and placing the scanner on the filing cabinet. Are the signals stronger? If so, try the following tests with an ohmmeter:

With the antenna removed from the magnetic base, set the meter to low ohms and touch one prod to the shell of the BNC connector, the other to the BNC center pin; the meter should not move (infinite resistance). If you are using adaptors, keep them in place, too; mismatched connectors are often problematic.

Next, touch one prod to the center pin of the male cable connector, and the other to the center hole of the BNC on the mount; it should show a short (perhaps an ohm or two). Repeat between the shell of the male connector and the shell of the connector on the magnet base. Both of these tests should confirm continuity of the shield and the center conductor from one end of the cable to the other.

If it passes, repeat the tests while wiggling the connector and also the cable at the mount to see if there is a loose connection. You may need an extra pair of hands for this!

Finally, check the center hole in the magnetic base to see if the leaves have somehow spread too far to touch the center pin of the antenna when it's inserted. The leaves can be easily pressed closer by pushing a pin behind each leaf and the insulation surrounding it.

Q. *While waiting to pass my ham test I bought a desktop scanner to listen to 2 Meters (144-148 MHz). While the plug-in antenna works well for that purpose, I don't seem to hear much else, especially on 6 meters (50-54 MHz). Is a scanner antenna for 6 meters different from a ham antenna for 6 meters? (Pat Hammond, KI4KEI)*

A. Congratulations, Pat, on passing your ham test!

The little plug-in antennas that come with desktop scanners are simple whips that work best in the 150-960 MHz range, but they are too short to work well on lower frequencies. Let's review some simple theory.

Virtually all antennas are fed at or near their electrical center. Even base-fed verticals use something to emulate the lower "half" of the antenna, often ground radials if earth-mounted, or metal ("ground plane") radials if elevated.

For mobile mount, the car body becomes the missing portion of the "center"-fed antenna, and even on a hand-held radio, your body is capacitively-coupled to the radio to substitute (usually poorly) for the missing lower element. A desktop scanner with a plug-in antenna uses the mass of the chassis metal as the missing portion. Now to your more specific question.

Any length of metal has a specific frequency to which it is "resonant;" that is, it has a feed impedance which matches that of the feedline, typically 50-70 ohms. If you make it longer, its feedpoint impedance rises; if made shorter, that impedance lowers.

It's a cyclical phenomenon – once the antenna length doubles the original resonant length, the impedance is several thousand ohms, quite a mismatch to your 50-70 ohm coax! Standing voltage waves (high SWR) may dissipate the usable signal as heat rather than deliver it to and from the radio receiver or transmitter.

But as the length increases further, approaching three times the resonant length for that frequency, the impedance lowers again toward 50-70 ohms. That's why center-fed antennas are often used on their odd harmonics.

For example, a 50 MHz (six meter amateur) antenna will work well at 150 MHz (the third harmonic), but a 150 (or in your case, 144 MHz) antenna won't work as well at 1/3 its frequency range (50 MHz), and its reduced length also means less signal-voltage capture.

An antenna designed for hamming on a particular frequency will work great for reception, too; after all, it was designed to transmit *and* receive on that frequency! And a thin, steel wire will receive just as well as a thick, silver pipe. Larger-diameter elements have the advantage of maintaining the feedpoint impedance for a slightly wider frequency range, that's all.

While it may be tempting to use a longer wire than necessary, the pattern no longer favors broadside to the element. As you move higher in frequency with the same length antenna, the pattern starts lobing, moving toward the ends. Thus, in a vertical antenna, you start looking upward for signals, and in a horizontal dipole, the best reception and transmission will be closer to the ends with a null perpendicular to the wire.

Q. *I am a newcomer to shortwave listening. What antenna do you recommend I use with my new Sangean ATS 909 portable radio? (Mitchell Diers, email)*

A. As with all of the shortwave portables, an external antenna will help strengthen incoming signals, but strong-signal overload is a common problem. In other words, while you could attach an enormous outdoor antenna, when you turned the radio on, you'd likely hear a barrage of signals all at the same time, because even though they aren't on the frequency the radio is tuned to, they are strong enough to break through the radio's limited selective circuitry.

Before selecting an antenna, find a good place to mount it. Outdoors, high, and away from your house and power lines is always the best choice.

Use coax cable from the antenna to the radio since its shielding will prevent the pickup of interference from the house wiring and appliances.

You can use a simple dipole like the popular Grove Skywire, or even an active antenna like the fast-selling H800 Skymatch. Use the DX/LOCAL switch set to DX to amplify the weakest signals, and on LOCAL to avoid strong-signal overload.

Q. *Is it true that the BC796D can be modified for 800-900 MHz scanning? If so, how it can be done? (Ricardo Sanchez, email)*

A. No. By federal law, no scanner can be manufactured in the U.S., imported or sold that can be modified to listen to cellular frequencies. Uniden was the first company to comply by designing circuitry that is potted with a sealant to prevent tampering.

THE MT ANSWER DESK

SPECIFIC FREQUENCY AND EQUIPMENT QUESTIONS

Larry Van Horn

larryvanhorn@monitoringtimes.com

Welcome to another edition of the *MT Help Desk* column. The purpose of this column is to answer specific radio hobby related questions from *MT* readers. These questions should relate to radio equipment, frequencies, listening techniques and other specific hobby related topics covering the entire radio spectrum. General radio and electronic questions will continue to be covered by Bob Grove in his *Ask Bob* column. Obviously all questions received cannot be answered in this column given space constraints. Due to limited time I will not answer snail mail questions.

So grab your computer keyboard and send in your hobby questions to the *MT Help Desk* at *larryvanhorn@monitoringtimes.com*.

Q. *I want to send some reception reports to overseas HF utility stations. Where can I find some addresses? – Several readers*

A. One of the best places on the net to find utility station QSL addresses is on a website run by Andreas Ibold, DE1DXX in Alpen, Germany. **http://hometown.aol.de/aibold/qaa.htm.** Be sure to tell Andreas that the *MT Help Desk* sent you.

Q. *I am looking for the frequencies used by the security police at the Air Force's Arnold Engineering Development Center. That base is the largest wind tunnel testing site in the country for all military and civilian air planes and space vehicles. It is located in Tullahoma, Tennessee. I think they use a trunk system, but I am not sure. - Wayne Thomas.*

A. Information has been very hard to obtain on this base. The only frequencies on their trunk system I have are several years old and I have nothing on any talkgroups in use at Arnold AFB. If you find no traffic on the frequencies below, search for trunk control channels in the 380-390 MHz range.

System: Motorola Type II (APCO-25 Compliant)
Motorola System ID: 4912
Frequencies: 406.7500 407.5500 408.3500
    409.1500 409.9500

Q. *As someone who is looking to get into scanning for the first time, I am interested in either the Alinco DJ-X7 or the Icom R5. I am looking for ease of operation, possibly with PC. I want to use the scanner for aircraft monitoring, both civilian and military, marine, and then public safety (police, fire, etc.). Can you give me an opinion? – Terry Booher, Navarre, Florida (near Pensacola)*

A. When I recommend a radio to anyone, my first and most important question to ask is, "What do you want to listen to?" and it should be your first consideration as well. Once you know what you want to hear, then you need to examine the radio spectrum at the location where you will primarily use the new radio.

Wideband radios such as the two mentioned by Terry above are very inviting purchases. Alinco and Icom both make mighty fine radios, but there is a very big caveat: Neither manufacturer makes trunk tracking radios. Please let me stress this to each company: The most important thing in any radio regardless of the spectrum covered is listening capability. I can have a radio that covers DC to light, but if a majority of the signals received by the radio can't be decoded and made intelligible out of the speaker, the extra frequency coverage is worthless. I'm not buying a radio to hear buzzy signals into the Gigahertz; I really do want to hear something intelligible.

The buzz words today in the world of scanning are *trunking* and *digital*. If our radios can't handle it, we will be missing much of the monitoring activity.

As for Terry's listening area, the Escambia County Public Safety agencies will be within range of Navarre and can be monitored on either of the two radios mentioned above. But the City of Pensacola (Police, Fire, etc) cannot, since they are using an 800 MHz Motorola Type II Smartnet. The Uniden BC-898 would serve you well, as would also the new Uniden BC-330T handheld scanner. Both are available from Grove Enterprises.

Q. *Have read your articles for a long time and appreciate all of your hard work. Do you by any chance have any frequencies for Misawa AB, Japan? I have found a few after searching for hours, but am not really coming up with much. Have done Inet searches with no luck. I sure would like to put my scanner back to good use. All of the frequencies I have found were in the 138/9 MHz range. Any ideas or sources? – Phil Hunsberger*

A. Overseas scanner information is always in short supply. Frequency information on bases overseas never appeared in any of the old Government databases that were circulated in the late '70s and early '80s. But you are in luck. The information below, from an anonymous source, came in a couple of days after I received your email!

Misawa Frequencies:
Approach Control   120.100 120.700 134.100
    248.200 255.400 258.200 258.600 261.000
    261.200 270.800 289.400 290.800 291.100
    306.100 317.800 317.800 335.600 335.800
    362.300
ATIS   128.400 315.350
Command Post   141.600 277.200
Control Tower   118.100 315.800
Departure Control 125.300 363.800
Draughon Range (Formerly Ripsaw Range)
    365.400
Ground Control   118.650 275.800
Meteo (Weather)   344.600
Naval Air Facility (NAF) Command Post 236.600
Pilot to Dispatcher (PTD)   131.400 313.600
Radar   250.300 [Tentative]
Supervisor of Flight 122.800 283.300
Terminal Controlled Approach   124.050
    288.100

Callsigns:

Callsign	Association (Aircraft)
8M###	NAF Misawa (C-12)

Appi	Japanese Self Defense Force (F-15J)
Arrow	35FW/14FS (F-16)
Bones	35FW/13FS (F-16)
Cardinal	35FW Supervisor of Flying
Coast Guard ###	Japanese Maritime Safety Agency (GS-V/SAAB340)
Crystal	Japanese Self Defense Force
Eagle ##	NAF P-3C in Local Pattern (P-3C)
Fang	35FW/13FS (F-16)
Flight Check	USAF Navigation Calibration Team (C-21)
Fusion	35FW/13FS (F-16)
Goose ##	919SOW Detachment (MC-130H)
Hammer	Unknown
Hawkeye	Japanese Self Defense Force (E-2C)
Headwork	Japanese Self Defense Force ATC Flight Following
Kai	Japanese Self Defense Force (F-4J)
Kanto	374AW Yokota Air Base, Japan (C-130H)
Katana	35FW/14FS (F-16)
Katana	VQ-1 (EP-3E)
Kendo	35FW/14FS (F-16)
Knife	18 Wing/12FS Kadena AB, Okinawa (F-15)
Kobe	35FW/13FS (F-16)
Lifter	Japanese Self Defense Force (CH-47J)
Madcat	35FW/13FS Supervisor of Flying (Tentative)
Maverick	Unknown (F-16?)
Mojo ##	51FW/36FS Osan AB, South Korea (F-16)
Ninja	35FW/14FS (F-16)
Panther	35FW/13FS (F-16)
Panther Ops	35FW/13FS (F-16)
PAT ###	US Army Priority Air Transport
PE ###	VQ-1 (EP-3E)
Radar	Japanese Self Defense Force (E-2C)
Razor	18 Wing/67FS Kadena AB, Okinawa (F-15)
Samurai	35FW/14FS (F-16)
Shogun	35FW/14FS (F-16)
Tiger	35FW/13FS (F-16)
Tori	18 Wing/909ARS Kadena AB, Okinawa (KC-135R/T)
Warlord	35FW
Warrior	35FW/14FS (F-16)
Weasel Ops	35FW Command Post
Wood	35FW/14FS (F-16)

Q. *Who is going to be using the 700 MHz band and why? – Bret Erickson*

A. Wow, a real loaded question here. And while I don't want this to sound like an editorial, the honest truth will make my answer sound like an editorial.

While I cannot give you specific agencies that will be using this band, because in most of the country the band is not in current use, I can talk in a general sense. The 700 MHz band will have two primary users, public safety agencies (for interoperability only) and business communications (to be auctioned). Congress is hoping to lessen the deficit with all that money coming into the U.S. Treasury.

As for part two of your question, why would they want to use it? That is the multi-million dollar question we have been asking for several years now. We honestly see no need for the new 700 MHz band, and unless every state and agency gets on the 700 MHz bandwagon and makes it a nationwide system (which isn't going to happen), it is just another way for politicians to waste taxpayer money and for some telecommunications company to make a lot of money.

Until next time, 73 and keep those questions coming – Larry.

Notification Networks

As much as you might like to, it's not always possible to listen to your scanner 24 hours a day, seven days a week. Even if you could, you still might miss big events that happen just outside your local area. For those times that you're otherwise occupied, you might consider joining a *notification network* to keep you informed about major events in your area.

Mass notification systems are already in use by government and commercial industries to keep them informed. Radio hobbyists, as well as off-duty public safety personnel, journalists, and other interested parties, have discovered the benefits of these networks. Depending on the area you wish to cover, there may already be an operating network to which you can subscribe.

Most event notification networks operate like this:

1. Volunteer monitors keep track of police, fire and medical activity in their geographic monitoring area using one or more scanners.
2. When something major or noteworthy occurs, the volunteer enters the details of the event into a short *alert message.*
3. The alert message is sent out over pager and cell phone networks to immediately inform subscribers. The message may also be sent to e-mail addresses and posted on an Internet web page.

For pager alerts, a subscriber must purchase (or already own) a pager and pay a monthly service charge to the paging service company. Notification networks may also have their own subscription fees.

Fire Notification Network of Michigan
http://www.fnnm.net

I stumbled across your website accidentally and found it very informative and thought you may be interested in the following. I belong to a group of scanner buffs called the Fire Notification Network of Michigan. It provides an alert to and updates on major police, fire, and EMS events through out the state, predominantly in southeast Lower Michigan at this time. We are hoping that

through more members the word will spread about us and we can get a wide range of participation to include the whole state. If you are interested in becoming a member, or know of anyone that is, feel free to contact us via our website at **http://www.fnnm.net***.*

Dave in Michigan

The Fire Notification Network of Michigan charges $24 per year for their service. They also list a number of affiliate paging networks in other parts of the United States.

Carolinas Fire Page
http://www.carolinasfirepage.com

Carolinas Fire Page (CFP) covers North and South Carolina, sending text messages to pagers and cell phones with incident notification information. Local authorities support the expansion of the notification system to interested citizens, seeing it as good way to keep community residents aware and informed.

CFP provides an example of the kind of message that would be delivered to subscribers:

CFP7: RALEIGH [WAKE] *SECOND ALARM* 12645 FALLS of NEUSE RD. E22 ON SCENE w/ 3 STORY WOOD FRAME APARTMNT BLDG, HEAVY FIRE SHWG THRU ROOF. COMMAND REQUEST RUSH ON EMS FOR REPORTED JUMPER. ENGINE COs TO BRING IN LDH. E22 E25 E15 T22 R19 C51 C5 SR5. 2ND ALM: E4 E19 T16 C54 EMS5 104. [788 ON SCENE via FIRE COMM][530]

Fire Net Chicago
http://www.firenetchicago.net

FireNet Chicago has been in operation for more than ten years and sends out alerts related to fire events in the Chicagoland area. Their system will deliver messages to pagers, cellular telephones with text-messaging capability, Blackberry devices, and to nearly any e-mail address.

TAC-9
http://www.tac9.com

TAC-9 Paging is one of the larger notification networks now operating, covering public safety incidents in Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. They also have a number of affiliate networks and will forward information on significant events from many major cities in the United States and Canada. Their network uses alphanumeric pagers.

Firecom/Newslink
http://www.dcfd.com/firecom.html

Firecom/Newslink delivers major event notification via pager (or cellular telephone with e-mail service) for incidents in Washington, D.C., Maryland and northern Virginia. An annual fee of $120 allows you to choose from any of six geographic and event "lists:"

Washington, D.C.-area Fire and Emergency Medical Service
Washington, D.C.-area Police and Traffic
Baltimore-area Fire and Emergency Medical Service
Baltimore-area Police and Traffic
Maryland major Fire, Emergency Medical Service, Police and Traffic
Nationwide Major Incidents

The Nationwide list comes from the TAC-9 network and includes event notification for more than 30 U.S. cities.

Hot News Alert Network
http://www.metrofire.org

The Metropolitan Fire Association of Atlanta, Georgia Inc. (MFA) operates Hot News Alert Network, providing incident reporting for the greater Atlanta area.

Massachusetts Notification Network
http://www.massnotification.org

MassNet started operating in 1991 and has grown into a two-way notification system using the General Mobile Radio Service (GMRS). A network of six GMRS repeaters in eastern Massachusetts and Cape Code allows subscribers to immediately hear and exchange information about emergency events in the area. A $100/year membership fee also gives subscribers a *MassNotification.org* e-mail address and access to the members-only areas of the web site.

More Networks

The Fire Notification Network of Michigan maintains a nice set of links to some other networks around the country at **http://www.fnnm.net/nin.shtml** As of December 2005, it included
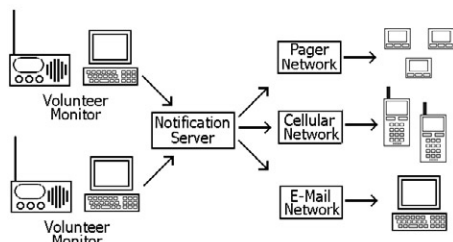
links for the following networks:

Baltimore Metro Dispatch
Chicago Firenet
Carolinas Firepage
Central Illinois Fire Network
East Coast Paging
Eastern Shores Fire Notification
Fire Page North West
FirePage Ohio
Fire Page Virginia
Gold Coast Fire Net
Maryland Fire Notification
Miami Valley Breaking News
Milwaukee Firenet
Mountain News Net
Metro Notification Network
New England Fire Notification Network
Ohio Fire News
St Louis Fire Notification
Tac-9 Paging
Twin City Fire Notification (Minneapolis / St Paul)
Youngstown Metro Fire Page Association

If your area isn't on this list, send me an e-mail at *danveeneman@monitoringtimes.com* and I'll try to locate one in your area.

❖ Hampton, Virginia

Hi Dan,

My name is Sally and I am trying to learn to program my Uniden BC246T handheld. My local police run on EDACS Networked Standard. I am having a hard time figuring out how to program from the manual directions. I have read about logical control numbers but don't see them listed on my list of frequencies (at least not anything called that).

I am not sure if the system is wide, narrow, or scattered either. I really would like to use the thing, but am feeling rather stupid right now! Please help or guide me to help if you can.

Thanks!
Sally in Hampton, Virginia

The city of Hampton is home to nearly 150,000 residents and is located in eastern Virginia, on the Chesapeake Bay. As Sally notes, the city operates an EDACS (Enhanced Digital Access Communications System) trunked radio system with analog voice channels.

EDACS operates with two distinct types of channels – *control channels*, which carry radio commands and status information between radios and repeater sites, and *voice channels*, which deliver the actual conversation. The control channels move digital information in the form of binary digits (*bits*). A "wideband" control channel, the most common and the one used by the city of Hampton, delivers information at the rate of 9600 baud. A "narrowband" control channel operates at half that rate, or 4800 baud.

The information transmitted from the repeater on the control channel includes commands for the radio to tune to specific frequencies. Rather than transmit the actual frequency itself, the repeater sends a number that represents the radio frequency. These numbers are referred to as *Logical Channel Numbers* (LCN).

The city of Hampton EDACS system actually has two "subsystems," each with their own set of LCNs. The first subsystem transmits from two different repeater sites, one at 60 Pine Chapel Road (at the Hampton Coliseum) and the other downtown at 22 Lincoln Street. Both sites are licensed to transmit on the same ten frequencies:

LCN Frequency
01   854.7125
02   854.9625
03   855.4625
04   855.7125
05   855.9625
06   856.7625
07   857.7625
08   858.7625
09   859.7625
10   860.7625

You will need to enter these frequencies in LCN order. Follow the directions in the BC246T Owner's Manual – the instructions for setting EDACS system frequencies is on page 59. The scanner will prompt you for the frequency and the LCN during the entry process.

The second subsystem is transmitted from a repeater site at Tappen and 6th Street (near Buckroe Park) and is licensed for these frequencies:

LCN Frequency
01   866.0375
02   866.2875
03   866.5625
04   866.8125

Here are some talkgroups that are reported to be active on the system. You may be able to double-check your scanner programming by listening for a Fire Dispatch simulcast on 46.06 MHz.

Decimal	AFS	Description
273	02-021	Fire (Dispatch)
274	02-022	Fire (Tactical 1)
275	02-023	Fire (Tactical 2)
276	02-024	Fire (Tactical 3)
277	02-025	Fire Support
290	02-042	EMS (Tactical 1)
291	02-043	EMS (Tactical 2)
292	02-044	EMS (Tactical 3)
512	04-000	Police (All Units)
529	04-021	Police (Channel 2)
530	04-022	Police (Channel 6)
531	04-023	Police (Channel 1)
532	04-024	Police (Channel 5)
545	04-041	Police (Channel 4)
546	04-042	Police (Channel 7)
547	04-043	Police (Channel 3)
561	04-061	Police (Channel 8)
577	04-081	Citywide 1
578	04-082	Citywide 2
579	04-083	Emergency Operations

The United States Army operates Fort Monroe in Hampton, home to the Training and Doctrine Command (TRADOC), responsible for developing doctrine and equipment requirements and for combat training. Last year the Department of Defense recommended closing Fort Monroe under the Base Realignment and Closure (BRAC) process. TRADOC and most of the other Army organizations now at Fort Monroe are slated to move to Fort Eustis in nearby Newport News or to Fort Knox in Kentucky.

Until the BRAC process is complete and everyone is gone, you might be able to hear Military Police on the base using 165.0625 MHz and the Fire/Medical teams on 169.0000 MHz.

❖ **Philadelphia, Pennsylvania**

Hello Dan,

I happened across one of your articles on the net and thought I would take a shot at asking you a rookie question regarding digital scanners to monitor Police/Fire transmissions here in Philadelphia. I want to buy my senior citizen mother a digital scanner as a gift. She has an old handheld PRO 24 that died. I saw some scanners on eBay, mostly Radio Shack PRO-96 and a few Bearcat digital models. I am looking into handheld for her and I saw a BC250D with an add-in APCO card that said 3600-baud. I know there are 3600 and newer 9600 baud models. I am very PC savvy but not too much on scanners (yet). Do you have any suggestions?

Thank You,
Tom in Philadelphia

Philadelphia Police and Fire Departments all use a Motorola Type II trunked radio system. All of the voice traffic is carried in digital format, under the APCO Project 25 standard. This means you will need a digital-capable scanner, and all of ones you mention should be suitable.

APCO Project 25 is a set of standards that specify how a radio system should operate. One standard specifies the way voice information is delivered over the air. This Common Air Interface (CAI) specifies the type of digital information passed between the radio and the repeater. The shorthand for this is "digital voice," although there are other digital trunked radio systems that do not use the APCO CAI.

P-25 Trunked System Channels
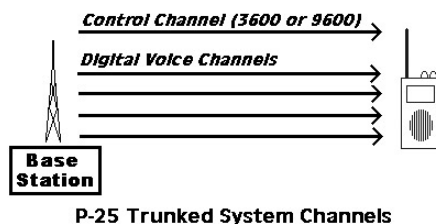
Another APCO standard is for control channel information on a trunked radio system. The standard operates at 9600-baud, which is why you will see reference to P-25 9600-baud networks. The older Motorola standard control channel format operates at 3600-baud. Systems using the APCO 9600-baud standard are sometimes called "Pure APCO 25" and require a more recent digital scanner to track. The BC250D you mention, for instance, will not correctly track the APCO 9600-

baud standard. However, it will properly decode the basic APCO CAI, as will all of the other commercially available APCO digital scanners.

The Radio Shack PRO-96 might be the easiest digital scanner on the market to program, since it offers pre-programmed "virtual scanner" folders. These folders hold complete scanner configuration data files for nearly all major trunked radio systems across the United States. There is also a tabletop/mobile version of this scanner, the PRO-2096, which might be more appropriate if expect that most of your mother's listening will be done from her home. It supports the APCO CAI as well as the APCO 9600-baud control channel, although Philadelphia uses the older Motorola 3600-baud version.

Setting up the PRO-96

Here's how easy it is to set up the PRO-96 for operation in Philadelphia:
1. With the scanner on, press [PGM] then press [FUNC] [PGM]. The scanner should display the V-Scanner menu. Press the number [2] to select the "Load" feature.
2. The Philadelphia system information resides in V-Scanner #5, which also covers Bucks County as well as the major systems in Delaware and Maryland. Press the number [5] to select V-Scanner #5. The scanner will prompt you to confirm your choice and indicate "BAL-MD-DE-PA" at the bottom of the display.
3. Press [ENTER] to confirm the selection, and press [ENTER] again to verify it's the one you want. The scanner will then load the information from storage into the scanner, and will display a "progress bar" of sorts along the bottom of the display. When the load is complete the scanner will prompt you press [ENTER] one last time to complete the operation.
4. Press [CLR] to exit the V-Scanner function. The scanner will reboot and will then be set to monitor activity on all of the systems in the virtual folder. So, with less then 10 keypresses, you can have the scanner ready for your mother to use in Philadelphia.

Of course, be aware that frequencies and control channels are subject to change at any time. If one day you no longer hear traffic, you'll need to do some internet research, find out what changed, and learn to reprogram the radio manually.

For those of you who wish to program things manually, here are some details on the Philly system. It's divided up into two "zones" with the following frequency assignments:

Zone 1
866.2875, 866.3625, 866.8375, 867.0625, 867.0875, 867.5625, 867.5875, 867.8625, 868.0625, 868.0875, 868.2875, 868.5875, 868.7875, 868.8125, and 868.8375 MHz.

Zone 2
866.1000, 866.3375, 866.5875, 866.6875, 866.7875, 866.8125, 867.1125, 867.3500, 867.8125, 867.8375, 867.9375, 868.3125, 868.3375, 868.5375 and 868.5625 MHz.

Talkgroups active in Zone 1 include:

Decimal	Hex	Description
3760	0EB	Emergency Medical Services
3792	0ED	Fire (North)
3824	0EF	Fire (South)
3856	0F1	Medical (North)
3888	0F3	Medical (South)
3920	0F5	Fire (South) Tactical 1
3952	0F7	Fire (South) Tactical 2
3984	0F9	Fire (South) Tactical 3
4016	0FB	Fire (South)
4048	0FD	Fire (North) Tactical 1
4080	0FF	Fire (North) Tactical 2
4112	101	Fire (North) Tactical 3
4144	103	Fire (North)
4496	119	Airport Police
4560	11D	Airport Emergency
4688	125	Airport Operations
4720	127	Airport Engineering
4752	129	Airport Maintenance
4816	12D	Airport Snow Removal
5360	14F	Sheriff (Dispatch)
7376	1CD	Sheriff
8560	217	Sheriff

Police Talkgroups active in Zone 2 include:

Decimal	Hex	Description
16	001	Far Northeast
48	003	Northeast
80	005	North Central
112	007	Central
144	009	South
176	00B	Southwest
208	00D	West
240	00F	North
272	011	Northwest
304	013	East
496	01F	Special Events 1
528	021	Special Events 2
560	023	Police Academy

Police patrol activity in Philadelphia is organized by District. Each district has a number and geographic boundaries. Some geographic areas and their associated district numbers are:

Location	District
Far Northeast	7, 8
North	14, 35
Northwest	5, 39
Northeast	2, 15
East	24, 26
North Central	22, 23
Central	6, 9
South	1, 17
Southwest	12, 18
West	16, 19
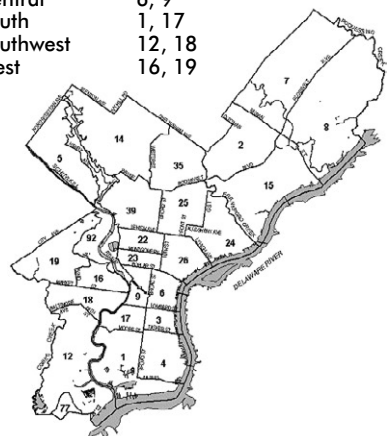
You can find a more detailed list of District boundaries at **http://www.ppdonline.org/ops/ops_districts.php**

That's all I have for this month. More information these and other topics are available on my web site at **http://www.signalharbor.com**. I welcome your questions, comments and frequency lists via electronic mail to *danveeneman@monitoringtimes.com*. Until next month, happy scanning!

UTILITY WORLD

HF COMMUNICATIONS

Hugh Stegman
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www.ominous-valve.com/uteworld.html

CBV: Playa Ancha Radio

Chile has 2650 miles (4265 kilometers) of coastline stretching from the tropics almost to Antarctica. As a consequence, its General Directorate of Marine Territory and Merchant Marine ("Directemar") operates a far-flung network of around 50 maritime radio stations.

The primary station and control point is at Playa Ancha ("Wide Beach"), near the capital, Valparaiso. It's a modern facility, with a nice transmitting site at 32 degrees, 48 minutes south, by 71 degrees, 28 minutes west. The callsign is CBV, not to be confused with the French-speaking broadcaster using this call in Quebec. Chile, not Canada, is now allocated the CAA-CEZ block, but the Canadian station operates with a very old call.

As coordinator of Navigational Warning Area ("Navarea") XV, Chile is responsible for safety and weather information in the waters from the Chilean coast out to 120 degrees west, and all the way down to Antarctica. CBV broadcasts Maritime Safety Information and weather data in both Simplex Telex Over Radio, mode B (SITOR-B), and radiofacsimile (FAX).

One SITOR-B schedule is the coastal zone's Navigational Telex (Navtex). Bulletins with the identifier "I" are sent in Spanish at 0010, 0810, and 1610 Coordinated Universal Time (UTC). Those identified "B" are in English at 0410, 1210, and 2010 UTC. While the frequency of 490 kilohertz (kHz) is usually used for non-English Navtex, CBV broadcasts everything on the main channel of 518 kHz.

On higher frequencies, SITOR-B weather information is broadcast in English and Spanish at 0110, 1210, 1610, and 1845 UTC. Navarea XV warnings are broadcast in English, and local warnings in Spanish, at 0215, 1430, and 2210 UTC. Frequencies are 4214.5, 4217.5, 8420.5, 8424, 12583.5, 12587, 16811, and 16814.5 kHz. Many receivers will read 1.7 or so kHz lower in tuning this mode.

The FAX is transmitted several times a day on 4228.0, 8677.0, and 17146.4 kHz. Use USB mode, with a dial reading 1.9 kHz lower. Settings are 120 Lines Per Minute, with an Index Of Cooperation of 576.

1. Playa Ancha Radio FAX Schedule		
Time (UTC)	Contents	Valid Time
1115	Surface Analysis	0600
1130	Satellite Image	0900
1630	Surface Analysis	1200
1645	Satellite Image	1500
1915	Significant Wave Map (MTS)	1200
1930	Satellite Image	1800
2200	Surface Analysis	1800
2215	Ice Report	none
2230	12hr Winds Barb Isotachs Forecast	1200
2310	12hr Surface Forecast	1200
2325	Satellite Image	2100

Table 1 lists the FAX schedule, though times can vary slightly. These are big, impressive charts, supplied by the Navy ("Armada de Chile").

There are also Spanish weather broadcasts in upper sideband (USB) voice at 0135 and 1435, on 2738 and 4357 kHz. The traffic list is given in USB at 1235 and 2335 UTC.

Chile has divided its long coast into zones, each with a Rescue Coordination Center. CBV's is RCC Valparaiso. There is also a procedure for fogbound vessels to get radar tracking, and in the Antarctic summer there is a special patrol in the Southern Ocean.

Ships in coastal waters are required to keep a watch on Very High Frequency (VHF) channel 16, an international calling channel which is monitored by all Chilean coastal stations and remote bases. Farther out, the traditional voice watch is maintained on 2182 and 4125 kHz USB. They also list 2738 kHz USB, the international intership working frequency.

In 1997, CBV implemented the new Digital Selective Calling (DSC) mode. It's part of the semi-automated Global Maritime Distress and Safety System (GMDSS) which replaced Morse telegraphy at sea. All of the common international DSC calling and distress frequencies are guarded. These are 2187.5, 4207.5, 6312.0, 8414.5, 12577.0, and 16804.5 kHz (again with the possible 1.7 kHz difference). In the DSC system, CBV's Maritime Mobile Service Identity (MMSI) is 007251860.

❖ DX Toolbox

I've been spending a lot of time with Chris Smolinski's excellent DX Toolbox shareware for the Windows PC. Chris, of course, is better known for his definitive Macintosh radio software, including Multimode, a full-featured decoding program. DX Toolbox, however, has versions for other platforms.

DX Toolbox addresses the fact that there are two kinds of DX ("distant transmitter") chasers in the world. One type just likes to go fishing and see what turns up on the hook. The other is more like a big game stalker. They go after particular target regions or services, heavily armed with all the propagation and solar-terrestrial data that is humanly possible to download, crunch, and massage.

DX Toolbox is for our second type. The sheer number of web sites and data streams out there can be truly boggling, and less time jumping around means more time checking the bands. It's convenient to have these various files and images linked from one program of manageable size and plugged automatically into the various graphs, calculators, and map plotters for optimum frequencies, gray lines, and such.

I had used this program in an earlier version, but at the time my Internet connection was slow and unreliable, making it hard to update the data. This is no longer a problem. Unless you're on a truly wretched dialup with low speed and slow name servers, the program should hum right along.

DX Toolbox is US $24.99 shareware. It's at **http://www.blackcatsystems.com/software/dxtoolbox.html**

❖ New Archive for US Inland Radio

Commercial marine radio on the US Great Lakes and rivers has always been kind of a neglected subject in the utility scene. This might be due to the switch to VHF that became pretty much complete in the 1980s and '90s, with the accompanying closure of most high-frequency stations.

Now there's a new web archive site for people who want to see how it used to be. It seeks any and all contributions of information and recollections from this old radio service that most of us probably never even knew existed. It's already absolutely topnotch radio history, packed with photos and descriptions of great radios and real operators. Hopefully it will continue to grow and become a definitive reference.

The Inland Marine Radio History Archive is at **http://www.imradioha.org/**

ABBREVIATIONS USED IN THIS COLUMN

AFB.............. Air Force Base
ALE .... Automatic Link Establishment
AM .... Amplitude Modulation
ARQ............. Automatic Repeat Request teleprinting system
AWACS .... Airborne Warning and Control System
CAMSLANT ... Communication Area Master Station, Atlantic
CW .... Morse code telegraphy ("Continuous Wave")
DEA .... US Drug Enforcement Administration
DSC .... Digital Selective Calling
EAM............. Emergency Action Message
E3 .... UK MI6/SIS "numbers," and Poacher tune
FAX.............. Radiofacsimile
FEC.............. Forward Error Correction teleprinting system
HFDL .... High-Frequency Data Link
HF-GCS .... High-Frequency Global Communications System
M8................ Cuban CW "numbers" cut to ANDUWRIGMT
M21............. Russian time-stamped air position plotting
MARS........... US Military Affiliate Radio System
Meteo .... Meteorological
MFA............. Ministry of Foreign Affairs
MX............... Russian single-letter beacons and markers
Navtex .... Navigational Telex
RTTY .... Radio Teletype
RSA.............. Republic of South Africa
S28............... Buzzy marker for UZB76 voice
S30............... Marker with beeps and occasional unid messages
S32............... Squeaky marker for unid voice "numbers"
SITOR-A .... Simplex Teleprinting Over Radio, ARQ mode
SITOR-B .... Simplex Teleprinting Over Radio, FEC mode
UK............... United Kingdom
Unid .... Unidentified
US .... United States
USCG .... US Coast Guard
V2 .... Cuban Spanish "female," 5-figure groups
V2a.............. 3-message V2 variant, most common

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

311.0	TBG-Non-directional AM beacon, Tanoga Island, Panama, at 2140. (Camilo Castillo-Panama)
350.0	DAV-Non-directional AM beacon, David, Panama, at 0228. (Castillo-Panama)
490.0	"E"-French Coast Guard, Corsen, SITOR-B Navtex in French, at 0040. "T"-UK Navtex, Niton, SITOR-B warnings in French, at 0309, 0709, and 2315. (Day Watson-UK)
3167.0	Charlie-US Navy, link coordination with Hotel, India, Sierra, and Romeo, at 0022. (Mark Cleary-SC)
3203.9	"L"-Russian solitary CW channel marker (MX), at 1827. (Ary Boender-Netherlands)
3756.0	The Pip (S30)-Beepy Russian military channel marker, CW at 1825. (Boender-Netherlands)
3828.0	The Squeaky Wheel (S32)-Russian channel marker, sounds just like the name, unknown modulation at 1825. (Boender-Netherlands)
3881.0	FAV22-French Forces, Mont Valerien, conducting on-air CW training exercises, parallel on 6825, at 1034. (Watson-UK)
4079.6	TMP 69-Pirate CW temperature beacon in southwestern US, continuously identifying "TMP" + degrees F, at 2324. (Hugh Stegman-CA)
4209.5	TAH-Istanbul Radio, Turkey, FEC traffic in Turkish, at 1951. (Bob Hall-RSA)
4294.7	FUE-French Navy, Brest, RTTY marker at 1940. (Hall-RSA)
4325.8	"R"-Russian military, solitary CW channel marker (MX), also on 5465.8, at 1829. (Boender-Netherlands)
4336.7	VTH-Indian Navy, Mumbai, RTTY test and traffic list at 1635. (Hall-RSA)
4625.0	The Buzzer (S28)-Buzzy Russian military channel marker, weird

	tone modulation at 1825. (Boender-Netherlands)
4721.0	"4"-Unknown US military, using ALE to direct-dial voice patches to Hilda (Air Mobility Command, Scott AFB, IL) via JNR, Salinas, PR, also on 5708 and 6721, at 0616. (Rick Baker-OH)
4724.0	Over Ride-US Military, with a 28-character EAM, taken out by a different EAM from McClellan HF-GCS and a third station, at 0553. Polo Game, with Over Ride's EAM at 0559. Over Ride, with same EAM at 0602 and a new 28-character one at 0606. (Jeff Haverlah-TX)
4777.4	IMB51-Rome Meteo, Italy, weak FAX upper air charts, parallel on 8146.5, at 0810. (Watson-UK)
4899.0	"P"-Russian Navy, Kaliningrad, CW solitary beacon (MX), at 1449. (Watson-UK)
4979.0	RKA2-Russian Navy, CW signal check with RLO2, at 0503. RALA2S, CW check with RBL70, at 0514. (Watson-UK)
4979.2	T4Z101-US Army 101st Airborne, working R26519 in ALE, at 1946. T54AA-US Army air ambulance, ALE sounds at 1947, 2017, 2148, and 2219. (Watson-UK)
5154.0	"C"-Russian Navy, Moscow, CW cluster beacon (MX), at 1644. (Watson-UK)
5320.0	Sector Hampton Roads-USCG, secure and clear with Cutter *Beluga*, at 2223. (Cleary-SC)
5437.0	FDI22-French Air Force, Narbonne, RTTY testing at 50/400, at 1720. (Watson-UK)
5696.0	Coast Guard 1708-USCG HC-130 airborne from El Salvador, setting guard with CAMSLANT at 0214. Sector Delaware Bay, making a radio check at 2300. (Cleary-SC)
5708.0	JNR-US Air Force Scope Command ground station, Salinas, PR, calling OFF, Offutt AFB, NE, in ALE including text message "OFF DE JNR HOW COPY?" at 0707. (Baker-OH)
5732.0	Shado 92-US Air Force C-130 on drug interdiction, no joy with two radio checks at 0114. (G. Jackson-OH)
5850.0	OXT-Copenhagen Meteo, Denmark, ice chart FAX with a Morse identifier, at 0943. (Watson-UK)
6712.0	03-HFDL ground station, Reykjavik, Iceland, passing weather to aircraft A6-ERC, an Emirates Airlines A340-541, at 1353. (Watson-UK)
6715.0	Line Maintenance-Canadian Forces, checking with Halifax Military, then a data transmission, at 2133. (Cleary-SC)
6761.0	Sentry 68-US Air Force E-3 AWACS coordinating refueling run with Tanker 15 at 1312. (Cleary-SC)
6767.5	USAIS1012-US Army Intelligence and Security Command, Ft. Belvoir, VA, calling USAFC1250, US Forces Command, also on 7448.5 and 7510, ALE at 1617. (Baker-OH)
6823.6	Unid-Russian Air Defense (M21), minute-stamped CW datagrams padded with "?," plus occasional intermediate strings in a different format, at 1610. (Watson-UK)
6855.0	Cuban "numbers" malfunction with Radio Havana music in AM at 2100, cut to numbers (V2a) in progress at 2110. Cuban "Atencion" numbers, 17 other loggings at 2100. (Castillo-Panama)
6958.7	Lincolnshire Poacher (E3), female voice with 5-number groups at 2229. (Castillo-Panama)
6959.0	Lincolnshire Poacher (E3), musical tune, then callup at 2204. (Castillo-Panama)
6985.0	R26154-US Army Blackhawk, calling T12, 12th Aviation Battalion, Ft. Belvoir, ALE at 1641. (Baker-OH)
6988.0	PUWP-Unknown CW station with hand-sent 5-letter groups, at 1404. (Watson-UK)
7313.5	AFA2AJ-US Air Force MARS, Vienna, VA, net control at 1304. (Cleary-SC)
7527.0	I62-US Customs and Border Protection aircraft, ALE-initiated voice with WST, Western Regional Communications Node, at 0213. (Baker-OH) Coast Guard 1718-USCG HC-130, setting guard with CAMSLANT at 1404. (Cleary-SC)
7657.0	93D-US Joint Task Force, tracking suspicious vessel with Panther (DEA, Bahamas), at 1916. (Cleary-SC)
7681.0	Cuban AM "Atencion" numbers (V2a), in progress at 1015. (Castillo-Panama)
7805.0	Chocope-Peruvian ALE net, calling BAR, Barraza, at 2331. (Baker-OH)
7821.7	Unid-Egyptian Diplomatic, idling in SITOR-A with short opera-

tor chats in Arabic, at 1645. (Watson-UK)

7887.0   Cuban "numbers" malfunction, with Radio Havana in AM at 2005, gone without the scheduled transmission at 2030. Cuban "Atencion" numbers, 14 other loggings at 2000. (Castillo-Panama)

7975.0   Cuban CW "Cut Number" station (M8), 5-letter groups at 2201. (Castillo-Panama)

8000.6   "S"-Pirate CW beacon in the southwestern US, bad frequency drift on keying, at 1819. (Stegman-CA)

8024.7   Unid-Egyptian Embassy, Madrid, SITOR-A operator chatter in Arabic at 1747. (Watson-UK)

8047.0   N080DN-Montana National Guard, calling HQ703N, probably the Readiness Center in VA, ALE at 1316. (Baker-OH)

8056.7   Unid-Egyptian MFA, Cairo, calling TVVX, Algiers, in SITOR-A, then gave the working frequency (7816.7) in SITOR-B, at 2224. (Watson-UK)

8084.0   Baseoperacion-Mexican military, calling ACERO ("steel"), ALE at 0011. (Baker-OH)

8097.0   Cuban AM "Atencion" numbers (V2a), bad audio, at 1810. Seven other loggings at 1800. (Castillo-Panama)

8171.5   LNKOPS-Nebraska National Guard, Lincoln, working R23307, a Blackhawk, ALE and voice, at 1611. (Baker-OH)

8301.6   Sector San Juan-USCG, PR, calling Stingray 28 (probable drug interdiction aircraft), at 2049. (Cleary-SC)

8414.0   H9IM-Vessel *High Consensus*, DSC safety call to an unknown coastal station at 0806. (Watson-UK)

8414.5   P3DN5-Vessel *Ozark*, DSC distress calls, position near St. Petersburg, Russia, at 0810. (Watson-UK)

8415.0   ELWN9-Vessel *Multitank Bracaria*, making a DSC intership call to vessel *Multitank Britannia*, at 0218 and 0220. (Watson-UK)

8635.0   VTG-Indian Navy, Mumbai, CW marker at 0137. (Castillo-Panama)

8971.0   Red Talon 713-US Navy P-3, passing ops-normal for self and Cardfile 711 to Fiddle (Jacksonville, FL) at 1833. (Cleary-SC)

8983.0   Coast Guard 1713-USCG HC-130, setting guard with CAMS-LANT at 1413. CAMSLANT Chesapeake, radio check with Sector Delaware Bay at 2302. (Cleary-SC)

8992.0   "T-1-N"-US Navy, patch via Air Force HF-GCS to Comsublant (Commander of Submarines, Atlantic) Watch Officer, at 1734. (Haverlah, TX) Titan 18-US Marine Corps KC-130, patch via Andrews HF-GCS to Titan Ops, at 1952. (Cleary-SC)

9007.0   Canforce 2608-Canadian Forces, opening watch with Trenton Military, Ontario, at 1934. (Cleary-SC)

9025.0   E30352-US Air Force E3B, ALE direct-dialed voice patch to Tinker AFB, OK, via OFF, Offutt AFB, NE, at 1537. (Baker-OH)

9041.0   5YE-Nairobi Meteo, RTTY weather at 1847. (Watson-UK)

9122.5   MVD1-US Army Corps of Engineers, Mississippi Valley Division, ALE and voice with MVP1, AR, at 1346. (Baker-OH)

9270.0   Shamrack-US military (perhaps "Shamrock" pronounced wrong), raised Offutt for data tests at 2235 and 2240. (Haverlah-TX)

9360.0   OXT-Copenhagen Meteo, Denmark, FAX ice chart at 1008. (Watson-UK)

10334.7 Unid-Egyptian MFA, Cairo, calling RCVB, Washington, in SITOR-A at 1957. (Watson-UK)

10444.0 TRUENO-Mexican military ("Thunder") calling TORMENTA ("Storm"), ALE at 0357. (Baker-OH)

10536.0 CFH-Canadian Forces, Halifax, NS, RTTY weather at 1926. (Watson-UK)

10858.0 Unid-Probably Cuban "Cut Number" station (M8), repeating slow CW callup only (DGDMA IUMIN GRMGN), from 1200 to 1202. (Watson-UK)

10945.0 CFH-Canadian Forces, Halifax, RTTY marker at 1233. (Watson-UK)

11173.1 RFGW-French MFA, Paris, coded ASCII message in STANAG 4285 for H6L, Algiers, at 0915. (Watson-UK)

11175.0 Offutt-US Air Force HF-GCS, NE, with many exercise EAMs at 1515. Toll Road, standing by for traffic (probably exercise Global Lightning 06), interrupted by Offutt for a priority "Skyking" message, at 2140. (Haverlah-TX) Deuce 86-US Air Force Air Mobility Command KC-10A, patch via Offutt HF-GCS to McGuire for a maintenance writeup, at 1604. (Cleary-SC) McClellan-US Air Force HF-GCS, CA, identifying self as Net Control and listening on 4724, 6739, 8992, 11175, 13200, and 15016, at 1930. (Mark Morgan-OH)

11232.0 Canforce 3446-Canadian Forces, working Trenton Military at

1249. King 21-US Air Force Rescue HC-130P, patch via Trenton Military to King Ops for a writeup, at 2330. (Cleary-SC)

12087.0 I070AN-Iowa National Guard, calling K070SN, Kansas National Guard, at 2110. (Baker-OH)

12577.0 3EVY6-Vessel *BV Mckinley*, calling Tenerife, Canary Islands, DSC at 1233. (Watson-UK)

12823.5 CTP-Portuguese Navy, Lisbon, working unknown vessel in RTTY, at 1522. (Watson-UK)

13200.0 McClellan-US Air Force HG-GCS, patching Cross Fire to Applause, at 1606. Skybolt 3-US military, patch via Offutt HF-GCS, at 1734. (Haverlah-TX)

13303.0 FX0006-Federal Express freighter, HFDL log on and position for ground station 17, Canary Islands, at 1104. (Watson-UK)

13537.8 ZSJ-South African Navy, Capetown, RTTY weather at 1710. (Watson-UK)

13570.0 HLL-Seoul Meteo, Korea, FAX forecast at 0835. (Watson-UK)

13597.0 JMH4-Tokyo Meteo, FAX dual chart at 0819. (Watson-UK)

13900.0 BMF-Taipei Meteo, Taiwan, FAX forecast at 0825. (Watson-UK)

13920.0 VMC-Australian Bureau Of Meteorology, Charleville, FAX chart at 0900. (Watson-UK)

14576.0 Offutt-US Air Force ground station, Offutt AFB, NE, came from 11175 to patch Bozo 61 (spelled callsign) to McGuire AFB Metro, NJ, at 1757. (Haverlah-TX)

15016.0 Reach 936-Air Mobility Command, patch via Offutt HF-GCS to Hilda, at 1430. (Cleary-SC) Sixpence-US military, broadcasting many special exercise EAMs, along with another station identifying as Attendant, at 1623. Jar Seal-Probable US military airborne command post, with two EAMs simulcast on 11175, at 1810. (Haverlah-TX)

15025.0 Smasher-US Joint Task Force, calling Evergreen 423 at 2154. (Cleary-SC)

15920.0 CFH-Canadian Forces, Halifax, RTTY marker at 1136. (Watson-UK)

16014.0 RFQP-French Forces, Djibouti, ARQ idler at 1135. (Hall-RSA)

16710.5 UIW-Kaliningrad Radio, Russia, traffic in Russian for unknown vessel in SITOR-A, at 1216. (Watson-UK)

16804.5 P3TJ9-Vessel *Nordmerkur*, DSC safety test to any USCG station, at 1618. (Watson-UK)

16806.5 NMF-USCG, Boston, SITOR-B high seas forecast at 1630. (Watson-UK)

16821.0 VRX-Hong Kong Radio, working an unknown vessel in SITOR-A, at 0833. (Watson-UK)

16830.5 SVO6-Olympia Radio, Greece, sending a SITOR-B maritime press bulletin in Greek, at 1300. (Watson-UK)

16898.5 XSG-Shanghai Radio, China, SITOR-B weather at 0856. (Watson-UK)

16906.9 FUV-French Navy, Djibouti, testing in RTTY at 1249. (Watson-UK)

16951.5 6WW-French Navy, Dakar, Senegal, testing in RTTY at 1329. (Watson-UK)

16986.0 CTP-Portuguese Navy, Lisbon, working a US warship in RTTY at 1522. (Watson-UK)

17146.4 NMG-USCG, New Orleans, weak FAX wind/wave forecast at 1256. (Watson-UK)

17934.0 "04"-HFDL ground station, Riverhead, NY, working N555TZ, an American Trans Air Boeing 757-33N, at 1447. (Watson-UK)

18560.0 BMF-Taipei Meteo, Taiwan, FAX wave forecast at 0828. (Watson-UK)

19200.0 DHN-Venezuelan Hydrographic and Navigation Directorate, calling PR1, Navy Radio Station #1, ALE at 1804. (Baker-OH)

20890.0 T42-US Customs and Border Protection, ALE sound at 1818. (Baker-OH)

23214.0 720-USCG Coast Guard 1720, a C-130H, ALE and voice for ops-normal and position for LNT, CAMSLANT, at 1810. (Baker-OH)

23337.0 OFF-US Air Force, Offutt AFB, calling JNR, Salinas, PR, ALE at 2258. (Baker-OH)

28075.8 "ID"-Fish net marker buoy, CW at 1448. (Castillo-Panama)

28076.2 "AA"-Fish net buoy, CW at 1447. "AA" also on 28116.4, 28151.3, 28170.7, 28156.6, 28170.5, and 28211.0. (Castillo-Panama)

28081.0 "V"-Fish net buoy, CW at 1457. (Castillo-Panama)

28166.4 "MD"-Fish net buoy, CW at 1513. (Castillo-Panama)

28180.7 "H"-Fish net buoy, CW at 1820. (Castillo-Panama)

DIGITAL DIGEST

DIGITAL MODES ON HF

Mike Chace

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All At Sea

This month we take a look at a couple of different systems that keep lives safe at sea and show how some simple equipment and a PC can be used to decode the digital signals used to keep the world's seas shipshape.

❖ GMDSS & Digital Selective Calling

In 1979, the International Maritime Organization (IMO) proposed a new system of communications to improve global safety at sea and search and rescue. Thus the GMDSS (Global Maritime Distress and Safety System) was born and, with it, the death knell for Morse Code, which until then was the recognized method of global distress signaling.

One of the many systems comprising the GMDSS is Digital Selective Calling (DSC) on HF and VHF radio. DSC is primarily intended to initiate ship-to-ship, ship-to-shore, and shore-to-ship radiotelephone and radiotelex calls. DSC calls can also be made to individual ships or groups of ships. DSC is also used to send distress alerts, which consist of a pre-formatted distress message, which is used to initiate emergency communications with ships and maritime rescue coordination centers.

DSC is designed to eliminate the need for ship's crew or on-shore station staff to continuously guard radio receivers on voice radio channels. Nowadays, most ship-borne radio equipment supports at least a basic DSC function.

DSC messages are relatively short and, on HF, are carried by a SITOR-B-like packetized and error-checked signal defined by the ITU-M493 protocol, sending data at 100bd with 170Hz shift. On VHF, the signal is sent using 1200bd and 800Hz shift. Here is an example of some live data, decoded on the 8MHz channel one afternoon by the GMDSS-DSC module of a Hoka Code30 system. In this example you can see three different message types:

FORMAT SPECIFIER: SELCALL individual
CALLED PARTY ADDRESS: 238145000 Croatia
CATEGORY: ROUTINE
SELF IDENTIFICATION: 238145000 Croatia
TELECOMMAND: J3E telephone
RECEIVE FREQUENCY INFORMATION: 16540.0 kHz
TRANSMIT FREQUENCY INFORMATION: 16540.0 kHz
BQ
CHECK SUM OK

FORMAT SPECIFIER: SELCALL individual
CALLED PARTY ADDRESS: 000000000
CATEGORY: SAFETY
SELF IDENTIFICATION: 003669997 United States of America
TELECOMMAND: TEST
RECEIVE FREQUENCY/CHANNEL INFORMATION NOT INCLUDED
TRANSMIT FREQUENCY/CHANNEL INFORMATION NOT INCLUDED
BQ
CHECK SUM OK

FORMAT SPECIFIER: SELCALL individual
CALLED PARTY ADDRESS: 003160018 Canada
CATEGORY: ROUTINE
SELF IDENTIFICATION: 000000000
TELECOMMAND: J3E telephone
SHIPS POSITION COORDINATES: NW LATITUDE 47 deg 30 min NORTH
LONGITUDE 87 deg 42 min WEST
RQ
CHECK SUM OK

One of the most important elements of the DSC message are the 9 digit MMSI (Maritime Mobile Service Identities) numbers of the originating and/or destination stations. These numbers uniquely identify ships, coast stations, satellite ground stations and also provide for group calling. For reference, here are the identities of the US coast stations:

CAMSLANT Chesapeake VA	003669995
COMMSTA Boston MA	003669991
COMMSTA Miami FL	003669997
COMMSTA Belle Chase LA	003669998
CAMSPAC Pt Reyes CA	003669990
COMMSTA Honolulu HI	003669993
COMMSTA Kodiak AK	003669899
US CG Group Ship Call	036699999
US CG Group Coast Station Call	003669999

MMSI numbers follow a specific format, and the full details of any ship or shore station can be researched with the ITU's MARS system (see Resources). As you can see from the examples, a number of the messages also include the radio channel frequency and position information of the ship or distress incident which you can plot on a map.

There are five HF channels on which you can hear DSC traffic: 4207.5, 6312, 8414.5, 12577 and 16804.5 kHz.

You can decode DSC using a number of popular software packages including RadioRaft, Hoka, Wavecom, DSC Decoder and Skysweeper decoders on Windows, in addition to MultiMode on Mac OS X. You can get details on all these packages from Mike Agner's Software pages at Utility Monitoring Central (see Resources).

❖ The Automatic Identification System

Another part of the GMDSS which is required for all ships over 300 tons in order to send details of their position to each other, is the Automatic Identification System (AIS). This system transmits short, high speed data bursts on two VHF Marine Band channels 87 and 88 (161.975 and 162.050 MHz) and sends details of a ship's identity, position, speed, course and destination.

This time, instead of a simple HF SSB receiver, one can use a cheap VHF scanner to monitor these movements. You'll probably have to make a simple modification to the scanner to

extract the discriminator output because such high speed data is used.

The software that allows you to decode the AIS traffic is called ShipPlotter (see Resources), which displays the data on your very own personal radar display of the sea traffic around you like the one in the figure below. Unfortunately, ShipPlotter is currently only available for Windows.
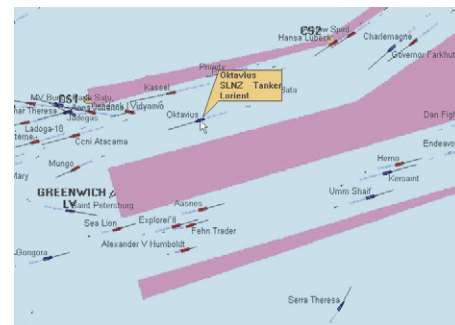
The popularity of the program has also spurred a number of enterprising companies like Katech (see Resources) to design dedicated receivers for feeding the software. Just plug in an antenna and hook up the soundcard input and you're ready to go.

❖ Ecuadorean Navy

And while we're on the subject of the seas... As I write this column, a new channel operated by Ecuador's Navy has come to light. Using 18450 USB for voice coordination, their familiar and very distinctive 109.1bd SITOR-B signal with a shift of 400 Hz can be heard around midday most weekdays on 18451.1 (center of data).

You can hear messages from most of the bases including Guayaquil, Quito, and other places. Traffic follows a set format with "allpp" beginning a message and addresses using six letter codes that together denote the location and Naval section originating the message.

The other frequencies on which to hear the Ecuadoreans are 7901.5, 12323.5, and 16416.5 kHz.

Resources:

ITU Mobile Access & Retrieval System
  http://www.itu.int/ITU-R/terrestrial/mars/index.asp
US Coast Guard Guide to GMDSS
  http://www.navcen.uscg.gov/marcomms/gmdss/dsc.htm
Ship Plotter
  http://www.shipplotter.com
Katech KATAS Receiver
  http://www.katas.co.uk

GLOBAL FORUM
THE WORLD OF SHORTWAVE BROADCASTING

Glenn Hauser

P.O. Box 1684-MT, Enid, OK 73702
glennhauser@monitoringtimes.com
www.worldofradio.com

U.S. Shortwave Stations Play "Musical Frequencies"

In recent days one can't depend on hearing a US shortwave station on the same frequency from one day to the next. We already reported some abrupt changes, such as WBCQ from 17495 to 18910. On Nov. 21, Dave Kenny in the UK told BDXC-UK that another US station was using the 60m band: WEWN was heard on new 5085 from 2359 in English, scheduled until 0500 per **http://www.ewtn.com/radio/freq. htm** listings. *Observer*, Bulgaria, also observed that WEWN on 5085 replaced 5875 which replaced 5810.

Dave Frantz of WWRB was incensed: said he had used 5085 every night for 9 years, and never got an interference complaint. But, earlier in 2005, FCC ordered WWRB to vacate 5085 because WWRB was QRMing a fixed service user on 5085; no further details. The FCC order caused serious economic loss to WWRB, Frantz said. Then 72 days later, they allowed WEWN on 5085 with 10 times the power.

We explained that if a US SW station wants an out of band (OOB) frequency, it can request it from the FCC. If there are no standing objections to its use, the station is OK'd to go ahead and try it, and see if using it generates any objections. In out-of-band operation, broadcasters operate only on a non-interference basis, and if there is objection from any higher-priority service, the station has to leave. That doesn't keep some other broadcaster from trying the same frequency later; interference circumstances may be different for them. Also, different seasons produce different propagation into different parts of the world, leading to interference some times and not others.

WWRB could also have re-applied for 5085, and maybe have gotten it again before WEWN did. But WEWN was also running the risk of an interference complaint, and guess what? A few nights later, WEWN moved again, this time to 6875!

Dave Frantz followed up, saying pressure from Homeland Security and other government agencies is to remove broadcasters from out of band frequencies, all of which are at risk! In the near future there may not be enough decent OOB frequencies to go around. Broadcasters may even have to idle transmitters for lack of frequencies! WWRB is canceling plans to purchase five Continental 418 DRM transmitters.

On the *Broadcast* mailing list, via Bob Foxworth, ABDX, Dave Orienti of WEWN complained: In the past several months, we have been moved off several frequencies in the 5 and 7 MHz band by FEMA reserving those frequencies. Not only do they want the frequency, they want a "guard band." Are there not enough other government allocated frequencies between 2-30 MHz for them to use?

The definitive background on this game of musical chairs came in the *National Association of Shortwave Broadcasters (NASB) Newsletter*: The Office of Spectrum Management of the National Telecommunications and Information Administration (NTIA), on behalf of FEMA, sent a letter to the International Bureau of the FCC on Sept 29, 2005, listing 115 Federal Fixed and Mobile Service frequencies in the shortwave bands. FEMA owns, operates and maintains a very large HF radio system known as the FEMA National Radio System (FNARS).

The NTIA letter asserts that the receivers in the FNARS HF network use current technology and still receive interference from shortwave broadcasters operating 13 kHz away from the FEMA frequency. The letter requests that the FCC immediately remove from the broadcast schedule any frequency located plus or minus 13 kHz from listed FEMA frequencies. Combined spectrum identified for protection by NTIA totals over 2000 kHz.

Licensees learned of the NTIA letter after the B05 schedule had been finalized and many broadcasters had already printed and distributed their frequency schedules expected to go into effect on October 30. If the NTIA / FEMA request is granted by the FCC, it would displace 120 hours of broadcasts by 14 private shortwave licensees. The three broadcasters with more than 20 hours in jeopardy are EWTN Global Catholic Radio, Family Radio and World Harvest Radio.

Some of the licensees scrambled to find new frequencies before B05 went into effect. Those that chose not to change, but to wait for the outcome of the FCC decision, were authorized those frequencies conditionally.

Upcoming Conferences

Planning has already begun for the World Radiocommunication Conference 2007, and the official U.S. proposals are now being discussed. One agenda item is the need for more spectrum for HF broadcasters between 4 and 10 MHz. NASB has introduced a draft proposal suggesting a 700 kHz addition to the broadcasting service spectrum between 4 and 10 MHz. The planning group will eventually have to come to grips with two very different proposals – the NASB proposal and a separate proposal from the NTIA which calls for no additional spectrum for broadcasters.

The A06 joint HFCC/ASBU and ABU-HFC conference will be hosted by the ABU and RTC (China Radio and Television) 13-17 February 2006, at Sanya City on Hainan Island in southern China. A number of larger organizations have yet to host an HFCC conference, and are being pressured to do so, per the *NASB Newsletter*.

We observe: the world's number one jamming nation: China! A less appropriate venue for HFCC would be hard to imagine. The only thing worse would be if China were not at least pretending to cooperate and were totally out of the organization.

My DXing

A tip from Sheldon Harvey's *Radio HF Internet Newsletter*: There is a wonderful web page for anyone interested in historical shortwave radio DXing. Mr. G. Kock of Finland put a page together featuring radio station photographs, audio identification files of various international radio stations, QSL cards and station pennants **http://www.filatelia. fi/dx/**

ALBANIA From Dec 5-6, R. Tirana broadcasts were missing, including English at 1945 on 7465, 7530, 2230 on 7110 (Erik Køie, Denmark, *DX LISTENING DIGEST*) Nothing but RTTY audible on 7455 after 0000 (gh) Also could not monitor our own broadcasts, so called the Fllaka station. Said they were ordered not to transmit R. Tirana until further notice, but to continue with TWR and CRI relays. The other station, Shijak, confirmed the order to *not* broadcast R. Tirana on SW (Drita Cico, Head of ARTV Monitoring Center, via Wolfgang Büschel, *DXLD*) Due to budget cuts for 2006, and early announcements that only Albanian and

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; B-05=winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

English External sections will survive (Wolfgang Büschel, Germany, *WORLD OF RADIO*) There were also drastic electricity shortages in Albania. A drought led to power cuts of 50% (RFE/RL via Chuck Albertson, *ibid*.) RTSH (the parent broadcaster) is in serious financial difficulties (Andy Sennitt, *Media Network* blog) I hope that this isn't the end for Radio Tirana, as I was quite fond of it. The listeners' letterbox on Tuesday read my letter (Christopher Lewis, UK, *DXLD*)
ARGENTINA The director of RAE told me that there are serious problems with the GE transmitter on 11710, and lots of problems with the antennas. This poor situation also demonstrates the deterioration of the diverse State owned

media in the country (Gabriel Iván Barrera, Argentina, via *BCDX*)

Station on 6214.06, which had been R. Baluarte, now IDing as R. Armonía, 100.7 FM, Puerto Iguazú, Misiones, heard at 2317 mixing Spanish and Portuguese (Jay Novello, NC, Horacio Nigro, Uruguay, *DXLD*) Also at 1001, still same management by Ministerio Camino Nuevo, new name for FM station ex-R. Maranatha (Arnaldo Slaen, Argentina, *DSWCI DX Window*)

LSB relay of La Red, 910, Buenos Aires, widely reported on 11133: 0200 with news, weather and sports (Björn Malm, Ecuador, *DXLD*) 0312 with football talk (Ilha Comprida DX Camp, SP, Brasil via Samuel Cássio, *radioescutas*) 0150-0205+ phone talk, ads, jingles, ID (Brian Alexander, PA, *DXLD*) 0200 with fútbol match (Raúl Saavedra, Costa Rica, *ibid*.) 0754-0809, talk and news, ID at 0800. Also 0556-0605, news and music, ID at 0600 (Kouji Hashimoto, *Japan Premium*) Military relay, Western music and Spanish announcements 0730. No sign of any of the other frequencies (Craig Seager, NSW, *ADXN*)

ASIA [non] In 2006 we hope to release a QSL card for the Winter Olympics, the Year of the Dog, the FIFA World Cup, and likely the 2006 Asia Games in Qatar. Automated QSL system is at **http://www.techweb.rfa.org** but it still takes a lot of work to process all the requests. We look at the confirmation of reception reports as a very important service since DXers provide us with so much valuable information about the technical quality of our broadcasts. We are not confirming any transmitter sites on our QSL cards; even IBB sites. ''In the interests of Homeland Security'' were the exact words used by our Director of Program Delivery (AJ Janitschek, R. Free Asia, via Edward Kusalik, ODXA *Listening In*)

AUSTRALIA Objective for our Kununurra site includes up to four 100,000 watt transmitters. A second HC100 was to be shipped from Ecuador in November 2005, and should be on site in Kununurra early 2006. This represents a gift of approximately one million Australian Dollars! However, we will need to retrofit the transmitter for 240 volt single phase 50 Hz power, special ducting and connections to the antenna switcher, etc., costing another $100,000 (*HCJB Australia News* via *ADXN*)

BOLIVIA George Lessard, who runs the excellent Creative Radio mailing list, was in La Paz, as a volunteer under a Canadian International Development Agency (CIDA) funded program, working with Radio Illimani, the Bolivian government's national radio network. Many photos of this, ERBOL and other Bolivian stations are at **http://www.flickr.com/photos/george-lessard/sets/** (via *Media Network* blog)

BURMA [non] See last month: Democratic Voice of Burma at 1430-1530 via Almaty, Kazakhstan, replaced 15480 with 9415 (*Observer*, Bulgaria)

CAMEROONS [non] R. Free Southern Cameroons, via Russia, 12130, Sundays only at 1800, heard 1825-1900* with continuous English talk about freedom in southern Cameroon. Weak but readable (Brian Alexander, PA, *DXLD*)

CANADA Vancouver transmitter site pics, including CKZU 6160: **http://community.webshots.com/album/197002392XEcLBS** (Theo Donnelly, BC, IRCA *Soft DX Monitor*)

CHINA CNR domestic service heard on 18159.9v at 0627; at first thought second harmonic but nothing heard on 9080; still at 0910. Next day at 0838 found // 17890. Amateurs complaining about the QRM. Also at 0038 // 17765 and 17645, spurs all over the place (Dave Vitek, *harmonics yg*) Old 100 kW Beijing transmitters, mixing product between 17625 and 17890 at 265 kHz separation, maybe also on 17360 (Wolfgang Büschel, *ibid*.) 18160 loud and clear at 0700; I am angry at this intruder (Morrison Hoyle, Vic., *WORLD OF RADIO*) 18160 also heard at 0947 here (Tim Bucknall, UK, *harmonics yg*) And here at 0237 (Stewart MacKenzie, CA, *shortwavebasics yg*)

[non] What have become of CRI relays via Voz Cristiana, Chile? From Merlin schedule B-05, all 100 kW at 45 degrees across Brazil: 11-12 15540 Portuguese, 12-13 15540 Greek, 13-14 15540 English, 21-22 17645 Portuguese (via WWDXC; *Observer*, Bulgaria)

COLOMBIA 2620.26, Micrófono Cívico, Palermo, Dpto. Huila, harmonic from MW 1310.13 recorded at 1000: **http://www.malm-ecuador.com** (Björn Malm, Quito, *DXLD*)

CUBA 2400 kHz, R. Revolución, Santiago de Cuba, at 0400, 2 x 1200 with national anthem and canned ID (Jay Novello, NC, *DXLD*)

DENMARK [non] *Copenhagen Calling* again on SW thanks to WRMI relay of WRN, 0630-0700 UT Sun on 7385 (gh)

DIEGO GARCÍA From early Dec, AFN USB frequencies previously listed for Diego García were again being heard: at 1240 on 12579, 1510 on 4319 (Jari Savolainen, Finland, HCDX) 2240 on 4319 (Steve Lare, MI, *DXLD*) 2329 on 4319, fair but very readable (Bill Harms, MD, *ibid*.) 1250 on 12579 (Steve Lare, MI, *ibid*.) Also heard in Copenhagen, at 1325 but 9980 USB [Iceland] stronger (Erik Køie, Denmark, *ibid*.) Not heard in over a year; 12579 best in early morning, here (Zeke Russell, AZ, *DXLD*) See also USA

DOMINICAN REPUBLIC On 2279.96, R Anacaona, San Juan de la Maguana, from 0150 tune-in, 2 x nominal 1140, strong with all-bachata format, pauses between each song as if programmed from an iPod; distorted audio, canned ID 0209 ''Radio Anacaona, La Reina del Sur.'' 0306 formal ID and NA, then unmodulated carrier past 031 tuneout (Jay Novello, NC, *DXLD*)

ECUADOR HCJB, 12005, full-data QSL card in one month with schedule and personal note stating that Jorge Zambrano of *Música del Ecuador* program has inoperable cancer (Marlin Field, MI, *NASWA Journal*) How sad. His excellent program used to have an English version, but is still 5 days a week in Spanish [on FM?], and a two-week audio archive at: **http://www.vozandes.org/index.php?option=com_content&task=view&id=25&Itemid=0** Try it for it at 0230-0330 UT Thu on 9745 (gh)

HCJB's future? Still trying to figure that out. Working with airport authorities affecting our Pifo transmitter site, and hope to get some definition in the next few weeks. Are DX publications asking about what is the situation in Pifo? Not much; they may feel handwriting is already on the wall, but that is not true. Radio team here desires to continue a SW ministry, but will it be all from here, with as many transmissions, or refocus, concentrate on

indigenous languages? Question is how to do that (Doug Weber & Ralph Kurtenbach, HCJB *DX Partyline*) See AUSTRALIA

ETHIOPIA [and non] R. Ethiopia home service heard at 1800 on 13799.1 // 9704.2, very low modulation (Mauno Ritola, Finland, via Wolfgang Büschel) Strange, VOA Amharic service was on 13800 at same time via Sri Lanka (Wolfgang Büschel, *DXLD*) So to jam VOA? (gh) Then IBB moved to 13790 and later to 13755 (Büschel)

[non] New target broadcast for Ethiopia added to TDP schedule **http://www.airtime.be/schedule.html** -- Voice of Ethiopian People, in Amharic, 1700-1800 Tue and Sat on 7380 (Bernd Trutenau, *DXLD*)

Website at **http://www.voep.net/** includes archived audio (Dave Kernick, *DXLD*) Any guesses as to transmitter site? Beware, rather distorted mp3 audio launches automatically (gh) Viz.: ''Covers a broad range of discussion topics including news, news analysis, history and current affairs. Special Note to All Ethiopians: The Voice of Ethiopian people must be heard and respected!'' New service, but old station? Amharic text mentions 1998 (gh) Weak at 1730 on 7380 (Tarek Zeidan, Egypt, *DXLD*)

FRANCE Partial RFI English (with changes from 26 Feb): M-F 0400-0430 7315-G, 9555(11995); 0500-0530 11850-G, 11995(15155); 0600-0630 15155, 17800; 0700-0800 11725-G; daily 1200-1230 15275-A, 21620; 1400-1500 17515; 1600-1700 9730-S, 11615, 15160-S, 15365(17850), 15605; 1700-1730 11615, 15605. Direct from France, except A=Ascension, G=Gabon, S=South Africa (from HFCC B-05 via Wolfgang Büschel, RFI via Jean-Michel Aubier, *DXLD*)

GAMBIA [non] Save the Gambia Development Project, Voices from the Diaspora: 2000-2030 Sat, 9405 via Jülich, Germany, 100 kW, 210 degrees in Wolof/English (*Observer*, Bulgaria)

GEORGIA A message from German service editors at Radio Georgia to the Internationale Medienhilfe organization via Rudolf Krumm says Radio Georgia staff were notified Nov 30 about a decision to wind up the foreign service. Financial problems were mentioned as reason, but they doubt that Georgian Radio really ran out of money. Radio Georgia editors are no longer on duty as of Dec 1, and they make a call for protests (Kai Ludwig, *DXLD*) Transmissions were already suspended months earlier; dissolving the external service in all languages including English (Bernd Trutenau, *ibid*.) English was at 0630 on 11805, 0830 and 0930 on 11910 (Erik Køie, Denmark, *BCDX*)

This is the answer to my inquiry about the closure of Radio Georgia from the new, attractive General Director of Georgian RTV, Tamar Kintsurashvili. She says that the closure is only temporary and service will be resumed when money has been found for repair. So there is hope, as to my experience it is hard to withstand the zeal and ambition of modern Eastern-European ladies :) (Eike Bierwirth, Germany, *DXLD*)

''The broadcasting service of Georgian Public Radio to Western Europe has been interrupted. But, please be informed that it's been stopped in March and I was appointed as a General Director just in August. It's only temporary measure due to technical problems that the channel presently faces. Transmitters are very old and outdated and require urgent replacement. Renewal of this and programs in foreign languages will take some time as updating the facilities requires serious financial resources. As soon as technical problems are solved, broadcasting to Western Europe will be renewed.'' (Tamar Kintsurashvili, General Director, Georgian Public Broadcasting via Eike Bierwirth, *DXLD*)

GREENLAND The KNR relay via OZL on 3815-USB was heard with Greenlandic and Danish talk at 2133-2212 in early Nov at the mainly MW Cappahayden, Newfoundland, DXpedition (Jim Renfrew, IRCA) Great; now how about further inland, even in USA? (gh)

GUAM AWR *Wavescan* was to resume in January, now produced in Singapore, says Rhoen Catolico, WS Coordinator (Tony Ashar, Indonesia, World DX Club via Mike Barraclough) JSWC will resume contributing DX news (Toshimichi Ohtake, *DSWCI DX Window*) But not Bob Padula, because Singapore executed an Australian (gh) An introductory edition of the new *Wavescan* went out on Sunday Dec 11, but regular airings were to start Jan 6, a Friday (Gautam Kumar Sharma, Assam, *WORLD OF RADIO*)

KOREA NORTH [non] *Shiokaze* (Sea Breeze), according to Asian Broadcasting Institute, broadcast by ''Investigation Commission on Missing Japanese Probably Related to North Korea'' expanded from a semihour to a sesquihour per day Dec 8, 1400-1500 with the first half hour of letters from victims' families repeated at 1900-1930. In 2006, planning to broadcast also in Korean and English (Takahito Akabayashi, Japan, *DXLD*) All still on 5890 via Irkutsk? (gh) Played a piano melody throughout the 1430 broadcast underneath the listing of names (Edward Kusalik, Alberta, *DXLD*) Address for reports is 2-3-8-401 Koraku Bunkyo Ward Tokyo 112-0004, Japan or chosakai@circus.ocn.ne.jp Website **http://www.chosa-kai.jp/indexeng.htm** (Luca Botto Fiora, *Radio&Media*)

Another new clandestine to N Korea, on 5880 via Irkutsk, began testing in late November, something called IME (Wolfgang Büschel) According to Tohru Yamashita, ABI, this began Nov 23 at 1500-1600 with explanation of Chinese historical facts and persons such as Confucius. Announcer speaks Korean with provincial accent, so seems to be some non-Christian religious broadcast produced outside Korea (Takahito Akabayashi, Japan, *BC-DX*) According to Tohru Yamashita of ABI, ''Radio Opened North Korea'' (*Yollin Pokkan Panson*) started regular transmission Dec 6 at 1500-1600 on 5880. Mostly programs of Radio Free North Korea organization of refugees, on violations of human rights. Well heard in Japan and South Korea without jamming. Closing music *Pomp & Circumstance* by Elgar (Takahito Akabayashi, Japan, *WORLD OF RADIO*) Free North Korea Radio (from South Korea), 5880, according to a well-informed source via Irkutsk, Russia. **http://www.freenk.net** (Bernd Trutenau, Lithuania, *DXLD*) 5880 quite audible at 1530 with fair signal, long interviews and speeches, occasional musical break to 1600* (Edward Kusalik, Alberta, *DXLD*)

LAOS [non] A few weeks into B-05, Hmong Lao Radio via WHRI changed from

Sat 12 and Sun 13 on 7520 to: Sat & Sun 14-15 on 11785, excellent here including variety of music including rustic. See **http://www.hmonglao-radio.org** and **http://www.h-lr.com/** (gh)

MAURITANIA 7245, R. Mauritânia, Nouakchott, 2136, Arabic and Arab music // 4845 (Rudolf W. Grimm, SP, Brazil, *DSWCI DX Window*) So they do have two SW transmitters; usually only heard on one (gh)

MÉXICO R. UNAM's return to SW 9600 with an ex-XERMX 10 kW transmitter experienced further delays. As of Dec 1, the antenna was 50% complete, but installation of transmitter was awaiting remodeling of the building, says Engineer Mejía (Julián Santiago, DF, *condiglist*) Current schedules show Cuba using 9600 only at 0000-0200, nothing else from or to the Americas, but lots of Chinese (gh)

NEW ZEALAND RNZI DRM service first tested on Dec 5 (Adrian Sainsbury via Mark Nicholls, ripple) Regular DRM starts 22 January:

    1651-1750 11610 NE Pacific, Fiji, Samoa, Cook Islands
    1751-2235 13595 All Pacific
    2236-0358 15720 All Pacific
    0400-0759 13690 All Pacific
    0800-1059 9460 All Pacific
    1100-1300 13840 NW Pacific, Bougainville, PNG, Timor, Asia
    1300-1650 7220 All Pacific

    (via Wolfgang Büschel, and *Observer*, Bulgaria, as amended) This is alongside the usual analog schedule, some on the same frequencies at abutting times, such as 15720 before and after above times (gh)

NIGERIA Off for two months or so, VON reactivated 15120 in early Dec, at 1700-1759*. Then announced schedule as 07-09 & 17-19 on 7255 in English (Thorsten Hallmann, Germany, *DXLD*) The second broadcast heard on 15120 by (Christer Brunström, Sweden, *SW Bulletin*, and Rudolf Grimm, Brazil, *DXLD*) 7255 at 1115 in vernacular (Carlos Gonçalves, Portugal, *ibid.*)

PERÚ An unID from Ancash Department heard at 2000 on 4060.2, very weak; later, believed to be R. Corazón de Huandoy (Alfredo Cañote, Chaclacayo, Perú, via Arnaldo Slaen, *condiglist, HCDX*)

    On 4385.7, R. Visión 1350, Chiclayo reactivated after several months, heard at 2340-0130, formerly known as R. Imperio; *Cancionero Andino* music until 0100, then pentecostal program (Rafael Rodríguez R., Colombia, *condiglist*) Also at 2332-2344 on 4385.6 (Carlos Gonçalves, Portugal, *DXLD*)

    On 4654.96, Radio Centinela del Norte, unknown QTH, new station? DJ said they want reception reports. Schedule will be 1000-0200 but closed UT Sat at 0130; has QRM from R. Martí spur on 4655.0 (Björn Malm, Ecuador, *DXLD*) As also heard by Terry Krueger, FL, mixing product from Greenville, 7405 leapfrogging 6030, but 7405 VOA English is UT Tue-Sat only (gh)

    Alfredo "Spacemaster" Cañote, Chaclacayo, Perú tells me he is hearing R. Willkamayu, on 10353 around 1259, SINPO 24412 (Arnaldo Slaen, HCDX) Last reported 3+ years ago, per Mark Mohrmann's LADX archive; then it was said to be testing with only 20 watts (gh)

ROMANIA RRI made some frequency changes Nov 20, including English: 0100 on 6150 ex-11970; 0400 on 6115 ex-6125 (*Observer*, Bulgaria) Had not been able to find a decent signal from them until 6150 came up, quite good, but some minor glitches, also on 9615; and at 2130 on 9755 (Bob Thomas, CT, *DXLD*) No Costa Rica on 6150? (gh)

RUSSIA 11975, *Kamchatska Rybatskaya* (Fisherman's Program), *0000-0030, sign-on with a drum roll, clear IDs, interview with a fisherman's wife about life in the Kamchatka Peninsula, modern Russian pop music. Unbelievable signal, 5x5 copy, pinning at well over 10db over S9 (Edward Kusalik, Alberta, *DXLD*) Runs to 0100 (gh)

SÉNÉGAL [non] After many delays, West Africa Democracy Radio started up Nov 14, not on the planned 17555 but on 12000 via UK at 0700-0900 (Andy Sennitt, *Media Network* blog) A week later it also tried // 15260 for a few days (Dave Kenny, UK, *DXLD*) 12000 from Woofferton, 15260 Rampisham (Bernd Trutenau, Lithuania, *ibid.*) Website made confusing info, such as an English program grid for 0700-0900 at **http://www.wadr.org/english/grille.html** altho the second hour was actually in French; another two hours at 0900-1100 were to be added in Jan, but were already on in Dec on 17860. Grid for this **http://www.wadr.org/grille.html** showed it all in French, but in fact English and French hours alternated, 0700-1100! (gh) Abdou Khadre Lô at WADR in Dakar explained that the transmission provider in UK said for seasonal reasons 17555 had to be replaced by 12000, and there would be one hour each of English and French at 0700-0900 (Jean-Michel Aubier, France, *DXLD*) Both 12000 and 17860 are 300 kW, 195 degrees from Woofferton (*Observer*, Bulgaria) John Wright, NSW, confirmed going from English to French at 1000 on 17860; hearing any of this in NAm in the middle of winter nights was unlikely (gh)

SRI LANKA [non] IBC Tamil, via WRN via Wertachtal, Germany, 0000-0100 on new 7110 (Wolfgang Büschel, *DXLD*) ex-6055 to avoid Spain (*Observer*, Bulgaria)

SUDAN [non] Sudan Radio Service, via UK, began the B-05 season on 11665 at *1500-1700*, very good (Brian Alexander, PA, *DXLD*) But by mid-November started using 15575 and eventually dropped 11665 which had Chinese interference; 15575 often good over here M-F; on weekends Portugal takes over 15575. SRS website **http://www.sudanradio.org/schedule.htm** continued to show obsolete 11665; note times are not UT but UT +3, and whether they actually broadcast on Saturday is unclear. Daily at 1505 there was a commercial for ant and termite killer made in Kenya; English until 1545, including segments on AIDS, then Arabic (gh, OK) 15575 is 300 kW, 126 degrees from Woofferton (*Observer*, Bulgaria)

TIBET [non] V. of Tibet, B-05: 100 kW, 131 degrees via Dushanbe, Tajikistan, frequencies vary up to 4 kHz to avoid Chinese jammers: 1056-1144 & 1212-1300 17560, 1304-1352 11605, 1430-1518 7465, but 7465 is totally blocked here by BBCWS DRM in English via Norway; also 250 kW, 45 degrees via Madagascar on 17550 at 1400-1430 & 1530-1600. The Dushanbe broadcasts are in Tibetan and Chinese; Madagascar only in Tibetan, for India (*Observer*, Bulgaria)

U S A [non non] A very few VOA English transmissions still come direct from the US in B-05, which means very good reception in the center of the continent, beyond the skip zones from Greenville, u.o.s., or Delano: 0400-0500 9575 to Af, 0500-0630 6035 to Af, 1900-2200 15580 to Af [ex-15445 in A-05], 0130-0200 Tue-Sat 7405 9775 13740-D to LAm. 15580 includes *Music Time in Africa* Sundays at 1930, and (too much) music on weekdays. Unless you have a very good signal from Greenville on 15580, there may be interference from buzz surrounding KTBN 15590 out to +/- 25 kHz (gh)

    From B05 beginning 10/30/2005, VOA does not use Greenville-A site, only -B. GA is totally silent, I only presume because of too few broadcasts from GA in A05 season (Dragan Lekic, Serbia, *DXLD*) I wonder if GA is being permanently mothballed. Would make an excellent and much-needed relay site for a number of foreign broadcasters if IBB has no use for it. Chuck, I wonder if you have any info on what is happening. Is GA being decommissioned? (gh) Glenn, Greenville Plant A is in caretaker status, two techs on site. Whether IBB will clear the site or will let it rust away remains to be seen (Charles Taylor, ex-IBB, Watching an area die, NC, *ibid.*) Appears to me that IBB would like to avoid an impression that Greenville A has been closed, by describing the current situation as ''not on air 24 hours'' (yeah, sure, zero hours are indeed ''not 24 hours''). I assume the two technicians keep the transmitters operational, so presumably GA could be fired up again, in theory and for the time being. In January 2004, AFGE Local 1812 reported that the budget for the Greenville Relay Station would be slashed by $150,000 (Kai Ludwig, Germany, *ibid.*) Former VOA engineering site near Greenville will not be site of a strip club, as had been proposed, per a story in the Greenville *Daily Reflector* (**http://www.kimandrewelliott.com**)

    After missing for a sesquimonth, 12133.5 and 7811.0 were again active with AFRTS (American Forces Radio and Television Service) from Saddlebunch Key as heard from 1521 past 1600 November 29 (gh, OK) I hear 5446.5 very well here in FL, but not 12133.5 and 7811 (Chuck Bolland, *DXLD*) AFRTS relays are via regular utility transmitters at US Navy bases, with low priority, in accordance with free capacities and may be taken off the air at any time if the transmitters are needed for utility communication; the temporary SW relays are not much needed anymore (Bernd Trutenau, *DSWCI DX Window*) See also DIEGO GARCÍA

    WRMI was finally back on 7385 in mid-Nov, 3.5 weeks after Hurricane Wilma with a temporary antenna, inverted V dipole, while it was taking another month to repair the badly damaged log periodic (gh) *WORLD OF RADIO* on WRMI 7385 rescheduled to Sun 1400 to Carib and 2230 to NAm (Jeff White, WRMI)

    [non] *WORLD OF RADIO* was broadcast on a European pirate station, Mystery Radio, on 6220 until 1831 on a Saturday (Jean Burnell, NF, *DXLD*) I also had a report of *WOR* on a Tuesday at 1500 on 6220, but times probably not reliable (gh)

    For a full week in early Dec, widow Melissa replaced Dr Gene Scott on his University Network with a continuously repeating rant for more financial support, which she said had declined by 50% since his death last February (gh)

    One of WYFR's OOB frequencies, 6855, has been colliding day after day in the 2100-2200 UT period with 5-digit YL Spanish numbers on exactly, and I do mean zero-beat, the same frequency, overriding WYFR at this location (gh, OK, mid-December)

    On 4440, WZFB, Fair Bluff, NC, at 0045 with a preacher, and IDs, 3 x 1480 and listed as 48 watts night power, but who knows? (Jay Novello, Wake Forest NC, *DXLD*)

VANUATU Non-data e-mail QSL from R. Vanuatu received after a 5-year wait: Fellow DXer Vince Stevens from Cape Town visited the station in October, taking along a reception report and tape from me for a transmission heard on 4960 in Otford, Kent, England on Christmas eve, 2000. Acting Technical Manager Warren Robert finally made contact via his personal email address (the station doesn't have email right now). He says they are in the process of printing new cards and that they are active as follows, converted to UT: 3945 1900-2130 & 0530-1130; 7260 2130-0530. 4960 is out of service (Graham Bell, England, *DXLD*) Mauno Ritola, Finland, heard it on 3944.76 around 1000 (Arnaldo Slaen, *condiglist*) 3944.8 signing on at 1900 in Bislama, anthem (Michael Schnitzer, Bavarian DX-Camp, *HCDX*)

VATICAN [non] You would not know it from the WEWN program grid, but two minutes of news in English from VR are heard at 2200 on 7560. With the British accent and seemingly secular content, I wasn't sure what it was at first, but 2202 it went into hymn from EWTN. I suppose they do this at other hourtops, too (gh)

VIETNAM 4739.7, R. TV Son La, at 1257-1306, theme music and ID (Kouji Hashimoto, *Japan Premium*)

    Dien Bien not heard on 6378 or 6442, but found on new 6317 (Kenji Takasaki, Japan, *HCDX*) Music and talks in local dialect on 6316.8, 1307-1330* At the same time, 4739.7 Son La audible to 1401* (Jari Savolainen, Finland, *DXLD*) Dien Bien, 6317v, 1230 with theme music; audio samples on my website: **http://tomsk-7.hp.infoseek.co.jp/index_e.html** (Kenji Takasaki, *HCDX*)

ZIMBABWE [non] VOA service to here is now easily audible back in the USA, on 17785 via Morocco, English 1730-1800; went to Ndebele at 1800 giving a frequency announcement with numbers pronounced in English. *Studio 7* is a rather lame name; why don't they call it ''Radio Free Zimbabwe''? (gh)

    Until the Next, Best of DX and 73 de Glenn!

0037 UTC on 6955USB
PIRATE: Voice of the Cat. First log of station, playing reggae music and male announcer as, "Kit Kat Marley." Station ID at 0041 noted as "broadcasting from Jamaica," with QSL maildrop as "P.O. Box 28413, Providence, RI 02908 USA," and reminder to enclose appropriate return postage. [*Ed.note: See Outer Limits re Providence maildrop being closed.*] Closing ID and comments to *Stay Cat Strut* by Brian Seltzer and the Stray Cats. Interval signal of cats meowing until 0047. Pirate-**Radio Cobaine** 6925USB, 2227-2338*. IDs and music from Alice Cooper and Nirvana. Also noted IDs for Radio Bingo, Radio Tornado and Radio Metallica Worldwide. Signal with intermittent fading. (Joe Wood, Greenback, TN)

0115 UTC on 4780
GUATEMALA: Radio Coatan. Spanish. Talk and interviews audible to 0130 to "Radio Coatan" identification. **Radio Buenas Nuevas** 4799.8, 0116-0126+ including "esta es Radio Buenas Nuevas" to campesino tunes. (Harold Frodge, Midland, MI) **Radio Verdad** 4052.5 at 0436. (Wood, TN)

0142 UTC on 11735
JAPAN: NHK/Radio Japan. Interview with professor including his opinion on the Iraq situation, followed by Japanese music. (Howard Moser, Lincolnshire, IL) Additional English monitoring as; 0000-0010, 6145 // 13650; 0100-0125 on 6030 // 11860; 0300-0318 on 21620 (weak).

0200 UTC on 9925
CROATIA: Croatian Radio. Item on bird flu in Croatia and efforts to lift ban on Croatian poultry industry. (Moser, IL) English newscast heard weakly at 0600-0605 in 13820. (Brian Bagwell, St Louis, MO; Frank Hillton, Charleston, SC)

0249 UTC on 6115
ALBANIA: Radio Tirana. National music program and evening segments. (Moser, IL) 7445 // 6115 at 0250. (Tom Banks, Dallas TX) 7110 to Europe on 2230-2248. (Duane Hadley, Bristol, TN)

0342 UTC on 9885
BOTSWANA: VOA relay. Another good program from VOA's African service. Interviews to *Africa World Tonight* news segment to *I'll Fly Away* tune. Three Botswana relays as; 12080, 0426 with sports round up and program on John Brown's Harper's Ferry, Virginia, raid in 1859; 4930, 0421-0426. (Wood, TN) 11835, 0413-0425. *Africa News Today*, ID and *Earth and Sky* feature. (Rich D'Angelo, Wyomissing, PA/NASWA Flash Sheet) 12080, 2020-2022; 13715 at 2048. (Wood, TN)

0358 UTC on 4965
ZAMBIA: Christian Voice. News and regional time check given as "South African time." Items about Zambia using a format similar to a U.S. morning drive-time routine. ID as "the Voice, the very best of gospel music." Text about Angola followed by schedules and frequencies amid faint signal. (Wood, TN) 4965, 0118-0130+. (Frodge, MI)

0420 UTC on 11815
BRAZIL: Radio Brasil Central. Portuguese. Vocals hosted by male announcer to station identification. Brief commercials at 0427, followed by extended ID and frequency quote for fair signal quality. (D'Angelo, PA) Brazilian's audible in Portuguese; **Radio Record** 6149.93, 0813 // 9504.82. (better). (Jerry Berg, Lexington, MA/NASWA Flash Sheet) **Radio Nacional de Amazonia** 6180 (ex 6185) 0718-0728 (Arnaldo Slaen, Buenos Aires, Argentina) **Radio Clube do Para** 4885, 0440-0450; **Radio Nacional** 4915, 0451. (Wood, TN)

0835 UTC on 9800
MONACO: Trans World Radio. Focus on the Family program to ID and brief interval signal. Signal poor to fair on trap-sloper to Europe. **TWR via Irkutsk** 7535, 1424-1450 in multilingual religious segments and Ids plus website address. Fair signal on 3.8 meter Loop. (Edward Kusalik, Alberta, Canada)

0935 UTC on 5960
RUSSIA: (Asiatic) Radiostansiya Tikhiy Okean via Vladivstok. Sign-on with chime interval signal into clean identification, followed by program on consumption of alcohol in Russia. Additional segment on taking a holiday on Russian cruise ships. (Kusalik, CAN)

1005 UTC on 9885
NEW ZEALAND: Radio NZ Int'l. *Wayne's Music* program focus on hard rock. (Fraser, ME) 6095, 1317-1332+; 9520, 1145-1202+; 15720, 2219-2230. (Frodge, MI)

1024 UTC on 7480
RUSSIA: Family Radio. (Via Komsomolsk-na-Amure. Japanese service to Asia plus interview on missionary work. Sign off at 1100 with IDs and website. Interval signal at 1100. (Kusalik, CAN)

1041 UTC on 3976
INDONESIA: Kalimantan-RRI Pontianak. Indonesian. Continuous Indo ballads through top-of-the-hour. Brief announcer's chat at 1106, then back to music. (Scott Barbour, Intervale, NH) **Voice of Indonesia** (Java) 9525, 1202-1255 English; 15149.84, 1931-1959+. (Frodge, MI)

1240 UTC on 15240
SWEDEN: Radio. **Nordic Lights** featuring Viking music. (Fraser, ME) 1335-1358 on 11550; 1445-1458 on 11550; 224802300 on 6065. (M.R. Phillips, Charlotte, NC)

1257 UTC on 6937
CHINA: Yunnan PBS (tent.) Chinese. Operatic music tuned in LSB due to interference. **China Radio Int'l** audible in English; 9440, 2052-2100+, *Life in China*; **CRI** 9620 9620 (Portuguese) 1920; CRI 13650, 1246 *Chinese Idioms* segment. CRI 11940, 1905-1910+; CRI 7285, 2006-2019+; CRI 9800 // 7285, 2030. CRI 11790, 2055-2101+. (Frodge, MI)

1525 UTC on 11980
RUSSIA: Voice of Russia. This Week in Russia program to "Voice of Russia World Service" identification. VOR 12115, 1640-1659; VOR 9890, 1711 /// 9820. (Frodge, MI) VOR 7330 at 2000 news into Moscow Mailbag. VOR 9890 at 1715. (Fraser, ME)

1500 UTC on 7380
VIETNAM: Little Saigon Radio via Taiwan. Sign-on with orchestra music and Vietnamese ID, including mentions of California location Music, commentaries and news items on Vietnam. Closing announcements including ID at 1526. Vietnamese ballad to 1530*. Reception good to fair despite slight noise and heterodyne. (Kusalik, CAN)

1530 UTC on 9650
URUGUAY: Emisora Ciudad de Montevideo. Spanish. Program on seasonal carnivals. Local "murgas" selections, and interviews with popular artist.(Slaen, ARG)

1628 UTC on 15605
FRANCE: Radio France Intl. Sports program's focus on soccer and tennis, with deep fades. (Bob Fraser, Belfast, ME) 17850 at 1650 with fading signal for news and sports. (Moser IL) 17620 at 1423; 17515, 1438-1444. (Wood, TN)

1710 UTC on 21680
ASCENSION ISLANDS: WYFR relay. Listener's call-in and chat on actual date of Christ's birthday. Fair with minimal static. **BBC Ascension Island relay** 12095 at 2022; 21470, 1722-1730. (Wood, TN)

1759 UTC on 11735
ZANZIBAR: Voice of Tanzania-Spice FM relay. English/Swahili/Arabic. Drums noted at sign-in to news headlines on opposition party progress and continuing recovery from Pakistan's earthquake. News concluded at 1810 into presumed newscast in Swahili.. ID heard as, "this news coming to you from Spice FM." at 1805. Signal fair/poor, best in LSB.(Barbour, NH)

2230 UTC on 7300
TURKEY: Voice of. Once Upon a Time Traveler, with good signal. (Fraser, ME) 15535 at 1242. (Frodge, MI) 17700 at 1550-1600; 7300 at 0453. (Moser, IL)

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times
English broadcast unless otherwise noted.

Variety: The Spice of Life

We've spent the last two months profiling the **BBC**'s programming and where and how to get it. However, the World Service is by no means the only important voice in international broadcasting.

Other stations which previously broadcast exclusively on shortwave are now extending their reach into other delivery platforms – the better to hear you (and be heard), my dear! So, our task this month – as it is every month – is to lead you to all the ways you can hear the creative, informative and entertaining programs produced by these stations. You may be surprised at just how many ways your favorites can now be had.

Personally, I'm beginning to find that I am less attached to my shortwave radio than I once was. (I say that with some personal and professional trepidation). In some ways, I feel almost disloyal to my old friends – the many receivers that festoon my home. On the other hand, satellite and the internet have allowed access to some of my favorite programs and stations in more places and at more times. Sometimes the audio is more pleasing to the ear, too.

Don't get me wrong. My shortwave radios are not going into storage anytime soon. I not only enjoy DXing; shortwave remains an important part of my "personal listening plan" (if that term doesn't sound too grandiose). However, I am first and foremost a "content" kind of guy. In that regard, I've learned by experience that it's never a bad thing to have options. In short, I listen to more radio now – and radio more now – than ever before.

Trends

In preparing these listings, some clear trends became apparent. The most obvious one is that the **World Radio Network** has become a prime vehicle for international broadcasting in North America. No fewer than 28 broadcasters use **WRN** to reach a continent-wide audience. Some, such as **RTE Ireland** and **Deutsche Welle**, use it as their primary means of doing so, eschewing the use of shortwave for this purpose. *MT*'s own Glenn Hauser is even on WRN!

A somewhat less obvious, but no less important development is the rise of **Sirius Satellite Radio** as a delivery platform for international broadcasters. Not only is **Sirius** the only subscription satellite carrier of **WRN**'s over two dozen international services, but Sirius also exclusively has **CBC Radio 1** and **CBC Radio 3**, **BBC World Service**'s **PRI** stream and **BBC Radio 1**. Furthermore, there's **Radio-Canada Premiere Plus** and **Bandeapart** (satellite feeds

of Canada's main French language network), **BBC Mundo** (Spanish), and **Radio Korea** (a commercial service in Korean). All of these are on their own dedicated channels 24 hours a day, seven days a week. Whether in the car or at home, **Sirius** has become an instrumental means for accessing international radio.

A third observation is that not all broadcasters share the same identifiable delivery strategy. For some, like **R.Japan** and **R.Taiwan Int**., shortwave remains by far the primary – and even sole – platform. Others, such as the **BBC**, **DW** and **RTE**, have abandoned shortwave (or at least its analog form) to us altogether. To say the least, we are in a period of transition; and, while most think they know which way the wind is blowing, some are still not too sure.

The Rules of This List

The listings this month intend to provide you with a logically constructed "map" for finding *some* of your favorite broadcasts across several delivery platforms. (We couldn't do it for *all* in the space of one month's column, no matter how hard we'd try.)

But beyond that, we also would like to give you a feel for how the delivery of cross border broadcasting is changing in North America. So, rule one is that *these listings will include only those broadcasters who actually intend to reach the North American listener*; and, rule two, they therefore include *only the means each is using to directly do so*. In other words, for this month, shortwave listings in this column will not include broadcasts that can be heard here if the broadcaster is not intentionally directing those shortwave frequencies in our direction.

The **abbreviations** for days of the week are the same as used in *MT's Shortwave Guide*. The **frequencies** for the shortwave broadcasts listed may be found in that section of this magazine, as well. Other abbreviations used which may need explanation include:

cbco - CBC Radio Overnight (on AM and FM frequencies across Canada)

drm - Digital Radio Mondiale (digital shortwave broadcast)

Int. - International

i-net - Internet

R. - Radio

siri - Sirius Satellite Radio (the number following indicates the channel)

sw - shortwave (analog)

wrn - World R. Network http://www.wrn.org North America stream. (Channel 140 on Sirius/siri140)

^ - local time used instead of UTC

' - minutes

❖ A Multiple Platform Approach

Our first group exhibits a distribution philosophy that employs the use of all platforms, under an expectation that current listeners will be retained and new listeners will be enticed. With its recent expansion of shortwave broadcasts and its debut on Sirius in a big way in December, **RCI**/**CBC** have really stepped up to – once again – be a major player in international broadcasting in the U.S.

R. CANADA INT./CBC
i-net: *www.rcinet.ca* (RCI); *www.cbc.ca/sirius* (CBC)
RCI - Three live 24/7 audio streams (English, French, Multilingual). English stream does not coincide with sw schedule and includes additional programming. All RCI programs available as audio on-demand w/archive.
CBC - Numerous regional audio streams with CBC Radio One national and local programming. CBC Radio Two and CBC Radio 3 audio streams also available. All CBC national and regional programs are available as audio on-demand w/extensive archives.

UTC	Mode	Notes
24 hrs.	siri137	CBC Radio One
24 hrs.	siri94	CBC Radio 3
0000	sw	2 hr. b/c (see below)
0330	siri136	Dispatches (M)
0500	siri136	4 hr. b/c M
0830	siri136	Dispatches (M)
0930	wrn	Sci-Tech File (M)
		Media Zone (T)
		Maple Leaf Mailbag (W)
		Spotlight (H)
		Business Sense (F)
1100	siri136	Ideas (M-F)
1200	siri136	Quirks & Quarks (S)
1300	siri136	Quirks & Quarks (A)
1400	sw	3 hr. b/c (see below)
	siri136	Sunday Edition (S)
		Ideas (M-F)
1800	siri136	Ideas (M-F)
		DNTO (A)
2100	sw	2 hr. b/c (see below)
2200	drm	2 hr. b/c (see below)

CBC Radio One on siri137:
News on the hr. *1107 S* **Roots & Wings** (folk music), *M* **Outfront** (first person stories), *T* **The Lab** (experimental radio), *W* **Global Village** (world music), *H* **Writers & Co.**, *F* **Vinyl Cafe** (humor), *A* **Quirks & Quarks** (science); *1212 S* **Sunday Edition** (arts/ideas), *M-F* **Business, Sports, Arts News**, *A* **The House** (politics); *1237 M-F* **The Current** (current affairs); *1307 A* **National Playlist** (pop music); *1407 M-F* **Sounds Like Canada** (magazine), *A* **Go!** (variety); *1505 S* **Tapestry** (spiritual), *F* **C'est la Vie** (French Canada); *1530 M-F* **National Playlist**, *A* **O'Reilly on Ads**; *1605 S* **Writers & Co.**, *M-F* **The Current 2nd Edition**, *A* **DNTO** (popular culture); *1705 M-F* **Freestyle** (magazine); *1712 S* **Sunday Edition**; *1907 M-F* (same as 1107); *1930 A* **Talking Books**, *F* **C'est la Vie**, *A* **Vinyl Tap** (rock music); *2130 H* **O'Reilly on Ads**, *F* **WireTap** (storytelling); *2200 M-F* **World at Six; 2230 M-F** As It Happens** (interviews); *2300 S/A* **World This Week-**

end; *2330 S/H* **Dispatches** (foreign correspondent), *A* **Inside Track** (sport); *0000 S* **Go!**, *M* **The Lab**, *T-A* **Ideas**; *0105 M* **Quirks & Quarks**, *T-S* **The Arts Tonight**; *0130 S* **WireTap**; *0145 T-A* **Between the Covers** (readings); *0200 T-A* **World at Six**; *0205 S* **DNTO**, *M* **Tapestry**; *0230 T-A* **As It Happens**; *0305 M* **Skylarkin'** (music & musings); *0405 M* **Vinyl Tap**, *T-A* (same as 1107, one day later UTC); *0505 T-A* **Ideas**; *0530 S* **Talking Books**; *0605 S* **National Playlist**, *M-A* **CBC Overnight**; *0705 S* **Vinyl Tap**; *0805 M* **Skylarkin'**, *T-A* (same as 2105 M-F, one day later UTC); *0830 F/A* (same as 2130 H/F, one day later UTC); *0845 T-H* (same as 2145 M-W, one day later UTC); *0905 S* **The Lab**, *M* **I Hear Music** (varied), *T-A* **Freestyle**; *1005 S* **The Singer and The Song** (the solo voice), *M* **The Lab**.

CBC Radio 3 **on siri94:** New Canadian music and artists (continuous).

RCI Plus: **multilingual service**, including all RCI output and additional material from partner stations (e.g. RFI), available to Canadian Sirius subscribers only on *siri188*.

SW:
0000 (120′) - *0000 S/M* **World This Weekend**, *T-A* **World at Six**; *0030 S* **Madly Off in All Directions** (comedy), *M* **Maple Leaf Mailbag**, *T-A* **As It Happens**; *0100 D* **News**; *0105 S* **Global Village**, *M* **Writers & Co.**; *0130 H* **Dispatches**.
1400 (180′) - *1400, 1500, 1600 D* **News**; *1412 S* **Sunday Edition, M-F The Current**, *A* **The House**; *1507 M-F* **Sounds Like Canada**, *T-A* **Vinyl Cafe**; *1607 A* **Quirks & Quarks**; *1630 F* **C'est la Vie**.
2100 (120′) - *2100, 2200 D* **News**; *2107 S* **Cross Country Checkup**, *M-F* **Freestyle**, *A* **DNTO**.

DRM:
2200 (30′) - *2200 S* **Maple Leaf Mailbag**, *M-F* **World at Six**, *A* **Madly Off in All Directions**.
2300 (60′) - *2300 S/A* **World This Weekend**, *M-F* **World at Six**; *2330 S* **Maple Leaf Mailbag**, *M-F* **As It Happens**, *A* **Madly Off in All Directions**.

R. Netherlands, a longtime favorite among listeners owing to its standard-setting production values and consistently unique and relevant programming, has valiantly maintained those lofty virtues in the face of continuous budget cuts. It, too – along with **R. Sweden** and **R. Prague** – conforms its distribution strategy to the belief that there is value to being accessible in all ways possible.

R. NETHERLANDS
i-net: *www.rnw.nl*
24/7 live audio stream in English; all programs available as audio on-demand w/archive.

UTC	Mode	Notes
1200	sw	
1300	wrn	
1900	sw	**2 hr. b/c; S/A only**
2300	wrn	
0100	sw	
0500	sw, wrn	
^	cbco	**0105 local time**
1005	siri136	**S only**

D 1200/1300/2300 (60′) - *:00 S* **Amsterdam Forum** (after news), *M-F* **Newsline**, *A* **Saturday Connection** (incl. listener letters); *:27 M* **Research File** (science), *T* **EuroQuest**, *W* **Documentary**, *H* **Dutch Horizons**, *F* **A Good Life** (development), *A* **Vox Humana** (culture).
S/A 1900 (120′) - *1900 S* **Vox Humana**, *A* **Dutch Horizons**; *1927 S* **Documentary**, *1930 A* **Saturday Connection**; *2000 S* **Amsterdam Forum** (after news), *A* **Vox Humana**; *2030 A* **Saturday Connection**.
D 0100/0500/^ - *:00 S* **Saturday Connection**, *M* **Amsterdam Forum**; *T-A* **Newsline**; *:27 S* **Vox Humana**, *T* **Research File**, *W* **EuroQuest**, *H* **Documentary**, *F* **Dutch Horizons**, *A* **A Good Life**.
S 1005 - **Euroquest**.

R. SWEDEN
i-net: *www.sr.se/rs*
Each transmission and most programs available as audio on-demand w/archive.

UTC	Modes	Notes
1330	sw	
1430	sw	
1530	wrn/na	
2000	wrn/na	**M-F only**
0230*	sw, wrn/na	
0330*	sw	
0605*	siri137	**S/M only**

^* cbco **0205 local (T-A)**
0305 local (S/M)
0730* wrn/na

D (30′) :*00 S** **Network Europe** (Europe magazine); *M-F** **News & Reports**; *A** **Headset** (music-1st A*), **Sweden Today** (2nd), **Destination** (travel/leisure-3rd), **Studio 49** (topical discussion-4th). *:15 M** **Culture** [incl. **Spectrum** (the arts-*1st/3rd M**)], *T** **Knowledge** [incl. **Greenscan** (ecology-*1st T**), **Heartbeat** (health-*2nd*), **S-Files** (things Swedish-3rd), **Edge** (sci-tech-4th);], *W** **Real Life** [incl. **Sportscan** (*1st W*), **Business Brief** (*2nd*)]; *H** **Lifestyle** [incl.**Cooking w/...** (Swedish cuisine-*1st H**), **Close-Up** (profiles-2nd), **Nordic Lights** (*3rd*), **Europefile** (*4th*)], *F** **Debate** (incl review of the newsweek).
*All listed programs UTC one day later at these times.

R. PRAGUE
i-net: *www.radio.cz/en*
Live audio streaming w/audio and text on demand, including archive.

UTC	Mode	Notes
1400*	sw	
1930*	wrn/na	
2230*	sw	
2330*	sw	
0100	sw	
0200	sw	
0300	wrn/na	
^	cbco	**0205 local (S/M)**
0400	sw	
1000	wrn/na	
^	cbco	**0520 local (T-A)**

D (30′) :*00 D* **News**; :*05 S** **Magazine** [or] **Insight Central Europe**, *M** **Mailbox**, *T-A** **Current Affairs**; :*10 S** **ABC of Czech** (the language), *M** **Letter from Prague**, *F** **Panorama** (all things Czech), *A** **Business Briefs**; :*15 S/T** **One on One** (interview) [or] *S** **Insight Central Europe**, *M** **Encore** [or] **Magic Carpet** (both monthly) [or] **Czech Books** (biweekly), *W** **Talking Point** (Czech issues), *H** **Czechs in History** [or] **Czechs Today** (both monthly) [or] **Spotlight** (travelogue), *F** **Czech Science**, *A** **The Arts**.
***All listed programs UTC one day earlier at these times.**

❖ N.A. Yes; SW No

Listeners using only shortwave might erroneously conclude that DW, R. Australia, RTE Ireland and Denmark are no longer interested in broadcasting to us. Whether for philosophical or budgetary reasons, all of these (and others) no longer use shortwave as a distribution platform in North America. But they have decided to emphasize other, perhaps (for them) more economical means to reach us.

DEUTSCHE WELLE
i-net: **www.dw-world.de**
24/7 in English. All newscasts, programs available as audio on-demand.

UTC	Mode	Notes
0205	siri136	**Newslink Plus (T-A)**
1500	wrn/na	**News, Africa This Week (S)**
		News, Newslink (M-F)
		News, Spectrum (science; A)
2000	wrn/na	**Inside Europe (A)**

R. AUSTRALIA
i-net: *www.abc.net.au/ra*
24/7 live stream; as sw sked w/alternative programs b/c during rights-restricted sports coverage. Most programs available as audio on-demand w/archive, many with transcript.
SW: 24/7 service targeting Pacific and Asia w/some region-specific programming. (Portions audible in NA. Reception is better in wNA.)

UTC	Modes	Notes
0100	wrn/na	**Verbatim* (S)**
		Asia-Pacific* (M)
^	cbco	**0230 local T-A**
0800	wrn/na	(see below)
^	cbco	**0505 local S/M**
1200	wrn/na	(see below)
2030	wrn/na	**Pacific Beat* (M-H)**
		All in the Mind* (F)

*after News.
0800 (60′) - *0800 D* **News**; *0805 S* **Australia Now**, *A* **Asia Pacific**; *0810 M-F* **PM** (news magazine); *0830 S* (to be announced), *A* **Innovations**.
1200 (60′) - *1200 D* **News**; *1205 S* **Correspondents' Report**, *M-F* **Asia Pacific**, *A* **Asia Pacific Business**; *1220 A* **Australian Express**; *1230 M* **Health Report**, *T* **Rural Reporter**, *W* **Religion Report**, *H* **Media Report**, *F* **Sports Factor**; *1235 S* **Talking Point**; *1250 A* **The Pulse**.

RTE IRELAND
inet: *www.rte.ie/radio*
4 domestic networks (3 in English) live streamed 24/7; most programs available as audio on-demand w/extensive archive.

UTC	Mode	Notes
1400	wrn/na	**(see below)**
1900	wrn/na	**Quantum Leap*** (science) **(S)**
		Five Seven Live* (news mag) **(M-F)**
		State We're In* (Irish society) **(A)**
2200	wrn/na	**Sports Results (S/A)**
		Five Seven Live (M-F)

1400 (60′) - *1400 D* **News**; *1410 S* **Sunday Miscellany*** (music, prose, poetry), *M-F* **Tubridy Show*** (breakfast program), *A* **It Says In the Papers** (Irish press review); *1415 A* **Playback** (best of the week on RTE Radio One).

BANNS R. INT. **(Denmark)**
i-net: **www.euroaudio.dk**
Weekly **Copenhagen Calling** available on-demand; also other content.
wrn: (30′) **S 0630** - **Copenhagen Calling** (magazine)

❖ Still Shortwave First

With the space we have left to us this month, we offer an example of a station still using primarily shortwave to reach North America. **Voice of Russia**, however, is "dipping its toe" into the satellite and internet platforms. It will be interesting to observe which direction the station chooses to take in the near future.

VOICE OF RUSSIA
i-net: *www.vor.ru/world.html*
Scripts of some programs in text form. Limited live audio streaming and 7 day on-demand archive of wrn/na broadcasts via *www.wrn.org/listeners*

UTC	Mode	Notes
0000	wrn/na	
0200	sw	**4 hr. b/c**
^	cbco	**0205 local S/M**
		0550 local T-A
0900	wrn/na	

0000 (30′) - *0000 D* **News**; *0011 S* **Kaleidoscope** (Russian events), *M* **Christian Message from Moscow**, *T/H/A* **Whims of Fate**, *W* **Guest Speaker**, *F* **Russia: People & Events**; *0016 T/H/S* **Russian Treasures**, *W* **People of Uncommon Destiny**, *F* **Russia: 1000 Years of Music**; *0024 T* **Russia: People & Events**; *H/A* **Guest Speaker**.
0200 (240′) - **News** - *on the hour and half hour*. *0211 S/M* **Moscow Mailbag**, *T-A* **Russia & the World**; *0232 S* **Our Homeland**, *M* **Timelines**, *T* **Folk Box**, *W* **Jazz Show**, *H* **Musical Tales**, *F* **Kaleidoscope**, *A* **Christian Message from Moscow**; *0254 H* **Russia: People & Events**.
0311 M **Sunday Panorama**, *T-S* **News & Views**; *0332 S* **Songs from Russia**, *M/F* **Russian by Radio**, *T* **Kaleidoscope**, *W* **Musical Tales**, *H* **Our Homeland**, *T* **Treasure Store**; *0354 S/M* **Russia: People & Events**. *0411 S* **Music & Musicians**, *M* **This is Russia**, *T* **Musical Tales**, *W/A* **Moscow Mailbag**, *H* **Science Plus**, *F* **Newmarket** (business); *0432 M* **Our Homeland**, *T/H/A* **Whims of Fate**, *W/F* **Guest Speaker**; *0447 T/H/A* **Guest Speaker**, *W* **People of Uncommon Destiny**, *F* **Russia: 1000 Years of Music**. *0511 S/M* **Musical Tales**, *T/F* **Moscow Mailbag**, *W* **Science Plus**, *H* **Newmarket**, *A* **This is Russia;** *0532 S* **Kaleidoscope**, *M/F* **Treasure Store**, *T* **Music Around Us**, *W* **Our Homeland**, *H* **Folk Box**, *A* **Timelines;** *0447 T* **Music At Your Request.**
0900 (30′) - **News** *on the hour*. *0902 T-A* **News & Views**; *0911 S/M* **This is Russia**.

More listings in March. Until then, good listening!

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn
gaylevanhorn@monitoringtimes.com

Postal Rate Increases to Affect Us All

With last month's domestic postal increase in the U.S., international rates have been adjusted as well. January's increase, the first since 2002, was required to fulfill a federal law passed in 2003.

Among the rate adjustments, the single-piece rate for First-Class Mail has increased from 37 cents to 39 cents, and the postcard rate has increased by one cent to 24 cents. Jim Miller, Chairman of the Postal Service's Board of Governors, commented, "The Governors take this action mindful of our obligation to assure the financial integrity of the nation's postal system."

That unpopular decision will affect QSL collectors, now digging a bit deeper to achieve that sought-after verification.

International rates are determined separately from domestic rates,

and have not been adjusted since January 2001. Will this increase force collectors to reconsider the option of electronic QSLing?

New Rates

First Class Letter (1 oz.) $0.39
Certified Mail $ 2.40
Postcards $0.24
Postcard (Canada & Mexico) $0.55
Other $0.84
1 oz letter:
Canada & Mexico $0.63
Other $0.84

AMATEUR RADIO

Canary Island-EA8AJO, 20 meter SSB. Full data color picture card. Received in 96 days via ARRL bureau. (Larry Van Horn, NC)

Israel-4X6FR, 10 meter SSB. Full data plain QSL card. Received in 25 days for one US dollar and Euro nested envelope to: Zvi Stessel, 46 Sevet Menashe, Herzliyya, 46684 Israel. (Van Horn, NC)

Montseratt-VP2MDO (NA-103) 10 meter SSB. Full data card. Received in 36 days for SASE to: QSL Manager, Jack Nienhaus W9NJB. 5045 Oak Center Drive, Oak Lawn, IL 60454. (Van Horn, NC)

USA-Fire Island Lighthouse (USIA NY-013-S/IOTA NA-026) 20 meters SSB. Received in three months for a SASE to: W2GSB/L.H., P.O. Box 1356, West Babylon, NY 11704. (Van Horn, NC)

BAHRAIN

Radio Bahrain 9745 kHz. Full data card with Broadcasting and Television logo, unsigned. Received in 57 days for an English report and one U.S. dollar. Station address: P.O. Box 194, Al Manamah, Bahrain. (Brian Bagwell, St. Louis, MO)

BRAZIL

Radio Educacão Rural de Tefé, Prepared QSL card stamped with illegible signature. Received in 53 days for a Portuguese report, mint stamps, SASE (not used) and a souvenir postcard. Station address: Praça São Sebastião 228, 69460-000 Coari AM, Brasil. (Frank Hillton, Charleston, SC)

GABON

NHK World/Radio Japan 15355 kHz. Full data *Early Autumn* card signed by T. Sato. Received in six months. Station address: Nippon Hoso Kyokai, Tokyo 150-8001 Japan. Website: **http://www.nhk.or.jp/daily/english/** (Edward Kusalik, Alberta, Canada)

LATVIA

Europa Radio Int'l via Ulbroka 9290 kHz. Date only card of *Red Sands Towers* off Whitstable, Kent, U.K. This site was once the home to Radio Invicta, K.I.N.G. and Radio 390. Verification noted this broadcast was their last for now. Received in four days for email report to: *alanday@europaradiointernational.co.uk*. Postal address: P.O. Box 299,

Whitstable, Kent CT5 2YA, United Kingdom. (Kusalik, CAN)

LITHUANIA

Radio Vilnius 11690 kHz. Full data station logo card unsigned. Received in 48 days for an English report, one US dollar and souvenir postcard. Station address: Lietuvos Radijas, Konarskio 49, LT-2600 Vilnius, Lithuania. **http://www.lrt.lt** (with English service link) (Tom Banks, Dallas, TX)

MEDIUM WAVE

Canada-CJRB1220 kHz AM. Verification letter, signed by Laverne Siemens-Dir. of Engineering, plus program schedule. Received in 290 days from original report. Delay in reply caused by QSL Manager leaving station, and a phone call to station resulted in confirmation. Very pleased, don't hear this station all that easy. Station address: Golden West Broadcasting Ltd., P.O. Box 950, Altona, Manitoba R0G O8O Canada. (Patrick Martin, Seaside, OR)

Philippines-DWAS 1125 kHz AM. No data QSL signed by Benjamin P. Munoz-Station Manager. Received in 46 days for a CD report. Station address: P.O. Box 78, Legazpi City 4500, Philippines. (Martin, OR)

KHWG 750 kHz AM. Partial data letter signed by Dee Gregory-General Manager, plus bumper sticker and business card. Station should be using 10,000 watts by now, as noted in letter for future plans. Received in 68 days for an AM report and one US dollar (returned). Station address: 1050 W. Williams Ave., Fallon, NV 89406. (Patrick Griffith, Westminister, CO)

KIDO 580 kHz AM. Prepared QSL card returned as verified, signed by Lee Erickson-Director of Engineering. Received in four days for an AM report. Station address: 827 Park

B1 #201, Boise, ID 83712-7782. (Martin, OR)

KION 1460 kHz AM. Full data verification letter signed by Jim Hilliker-News Writer, plus coverage map. Received in 17 days for a taped report. Station address: 903 N. Main Street, Salinas, CA 93906. (Martin, OR)

KJOP 1240 kHz AM. QSL note written on business card, signed by Ralph Neste. Bumper stickers for AM 1620 and 1230 stations enclosed. Received in 665 days for tentative cassette report. Station address: Immaculate Heart Radio, 2309 West Alpine Ave., Stockton, CA 95204. (Martin, OR)

KPTK 1090 kHz AM. Friendly letter signed by Paul Fredricks-Operations Manager. Bumper and window stickers enclosed. Received in 37 days for a CD report. Station address: 1000 Dexter Ave. North, Suite 100, Seattle, WA 98109. (Martin, OR)

KSPA 1510 kHz AM. Full data verification letter, signed by Jeff Gehringer-Business Manager, plus station promo info. Letter received in person for a CD report. Thanks to Martin Foltz, at the IRCA convention, who drove me over, so both of us could get the QSLs and letter. Station address: 1045 S. East Street, Anaheim, CA 92805. (Martin, OR).

MEXICO

XERTA 4810 kHz. Full data commemorative flags card, unsigned. Received in 37 days for a Spanish report. Station address: Radio Transcontinental de America, Plaza San Juan No.5, Despacho 2, Centro Histórico 06070, México D.F. México. Website: **http://www.misionradio.com** (Arnaldo Slaen, Buenos Aires, Argentina)

NETHERLANDS ANTILLES

Bonaire-Radio Japan/NHK World, 11935 kHz. Full data, *Waiting For Their Turn*, children's school QSL card signed by T. Sato. Received in six months. (See Gabon address) (Kusalik, CAN)

UNITED STATES

KNLS-Alaska 9655 kHz. Full data color *Studio in Anchor Point* card unsigned, plus station pennant. Received in 65 days for an English report and two mint stamps. Report sent to Operations Center at: World Christian Broadcasting, 605 Bradley Ct., Franklin, TN 37067. (Sam Wright, Hattiesburg, MS)

HOW TO USE THE SHORTWAVE GUIDE

• •

```
0000-0100 twhfa   USA, Voice of America   5995am  6130ca  7405am  9455af
   /   /   /            /         /                 /   /
   ①   ②   ⑤           ③        ④                  ⑥   ⑦
```

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Standard Time) 5, 6, 7 or 8 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 7:30 pm Eastern, 6:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. On the top half of the page English broadcasts are listed by UTC time on ① , then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not *daily*, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

```
Day Codes
s/S        Sunday
m/M        Monday
t/T        Tuesday
w/W        Wednesday
h/H        Thursday
f/F        Friday
a/A        Saturday
D          Daily
mon/MON    monthly
occ:       occasional
DRM:       Digital Radio Mondiale
```

In the same column ⑤, irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions.

But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

```
Target Areas
af:    Africa
al:    alternate frequency
       (occasional use only)
am:    The Americas
as:    Asia
au:    Australia
ca:    Central America
do:    domestic broadcast
eu:    Europe
irr:   irregular (Costa Rica RFPI)
me:    Middle East
na:    North America
oc:    Oceania
pa:    Pacific
sa:    South America
va:    various
```

MT MONITORING TEAM

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Thank You ...
Additional Contributors to This Month's Shortwave Guide:

Rich D'Angelo, *NASWA Flash Sheet*; *BCL News; Cumbre DX;* Glenn Hauser, Enid, OK/*DX Listening Digest*, Md. Azizul Alam, Rajshahi, Bangladesh; Daniel Sampson/*Prime Time-SW; DX Window; Observer*, Bulgaria; ODXA/DX Ontario; Larry Van Horn N5FPW, MT Asst. Editor; *Hard Core DX; NASWA Journal;* WWDX.

Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

Note 1   Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2   Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3   WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007. They are only authorized on a non-interference basis until that date.

Note 4   WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

GLENN HAUSER'S WORLD OF RADIO
http://www.worldofradio.com

For the latest DX and programming news, amateur nets, DX program schedules, audio archives and much more!

0000 UTC - 7PM EST / 6PM CST / 4PM PST

0000	0015	vl	Cambodia, National Radio	11940as		
0000	0015		Japan, Radio	6145as	13650as	17810as
0000	0030		Australia, HCJB	15530as		
0000	0030		Burma, Dem Voice of Burma	5955eu		
0000	0030		Egypt, Radio Cairo	11885na		
0000	0030		Thailand, Radio	9680af		
0000	0030		UK, BBC World Service	3915as	5970as	
			6195as	9410as	9740as	11945as
0000	0030		USA, Voice of America	6235as	7120va	
			9890va	11760va	15185va	15290va
			17740va			
0000	0045		India, All India Radio	9705as	9950as	
			11620as	11645as	13605as	
0000	0057		Canada, Radio Canada Intl	9755am	9800as	
0000	0059		Spain, Radio Exterior Espana	6055na		
0000	0100		Anguilla, Caribbean Beacon	6090am		
0000	0100		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek		4910do	
0000	0100		Australia, Radio	9660pa	12080pa	13630pa
			13670va	15240pa	17715va	17750as
			17775as	17795pa		
0000	0100		Bulgaria, Radio	7400na	9700na	
0000	0100		Canada, CFRX Toronto ON	6070do		
0000	0100		Canada, CFVP Calgary AB	6030do		
0000	0100		Canada, CKZN St John's NF	6160do		
0000	0100		Canada, CKZU Vancouver BC	6160do		
0000	0100		China, China Radio Intl	6020na	6075as	
			7180as	7345na	9570na	
0000	0100		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0000	0100		Germany, Deutsche Welle	6030as	7290as	
0000	0100		Guyana, Voice of	3290do		
0000	0100		Malaysia, Radio	7295as		
0000	0100	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0000	0100		Netherlands, Radio	6165na		
0000	0100		New Zealand, Radio NZ Intl	17675pa		
0000	0100	DRM	New Zealand, Radio NZ Intl	15720pa		
0000	0100	vl	Papua New Guinea, Wantok R.Light	7120va		
0000	0100		Singapore, Mediacorp Radio	6150do		
0000	0100		UK, BBC World Service	5975ca		
0000	0100	DRM	UK, BBC World Service	6010na		
0000	0100		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
0000	0100		USA, KAIJ Dallas TX	5755na		
0000	0100		USA, KTBN Salt Lake City UT	7505na		
0000	0100		USA, KWHR Naalehu HI	17655as		
0000	0100		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0000	0100		USA, WBOH Newport NC	5920am		
0000	0100		USA, WEWN Birmingham AL	6875va	7540va	
			11870va	13615va		
0000	0100		USA, WHRA Greenbush ME	5850na	5875na	
			6195na			
0000	0100		USA, WHRI Noblesville IN	7315am	7490am	
			15665am			
0000	0100		USA, WINB Red Lion PA	9320am		
0000	0100	twhfa	USA, WRMI Miami FL	7385am	9955am	
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WWCR Nashville TN	3215na	5070na	
			7465na	13845na		
0000	0100		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0000	0100		USA, WYFR Okeechobee FL	6065am	9505am	
			17805va			
0000	0100		Zambia, Christian Voice	4965af		
0013	0030	twhf	Austria, Radio Austria Intl	7325ca		
0015	0030	sm	Austria, Radio Austria Intl	7325ca		
0015	0030	a	Austria, Radio Austria Intl	7325ca		
0030	0045	s	Germany, Pan American BC	5945va		
0030	0100		Australia, Radio	15415as		
0030	0100	fas	Germany, Bible Voice Broadcasting		6010as	
0030	0100		Lithuania, Radio Vilnius	9875na		
0030	0100		Thailand, Radio	5890na		
0030	0100		UK, BBC World Service	11955as	15280as	
			15310as	17655as	17790as	
0030	0100		UK, BBC World Service	5970as	6195as	
			9410as	9740as	11955as	15280as
			15310as	15360as	17790as	
0030	0100		USA, Voice of America	7130va	9620va	
			11805va	15205va		
0033	0100	sm	Austria, Radio Austria Intl	7325va		
0040	0058	twhf	Austria, Radio Austria Intl	7325va		
0040	0100		Vatican City, Vatican Radio	7335as	9865as	
0043	0058	a	Austria, Radio Austria Intl	17855va		
0045	0100		Pakistan, Radio	7445as	9340as	
0055	0100		Italy, RAI Intl	11800na		

0100 UTC - 8PM EST/ 7PM CST / 5PM PST

0100	0115	m	Australia, HCJB	15405as		
0100	0115		Italy, RAI Intl	11800na		
0100	0115		Pakistan, Radio	7445as	9340as	
0100	0127		Czech Rep, Radio Prague Intl	6200na	7345na	
0100	0129	s	Germany, Universal Life	7145na		
0100	0130		Australia, Radio	17775as		
0100	0130		Slovakia, Radio Slovakia Intl	7230na	9440sa	
0100	0130		Uzbekistan, Radio Tashkent	7160as	7190as	
0100	0130		Vietnam, Voice of	6175na		
0100	0157		Romania, Radio Romania Intl	6150na	9615na	
0100	0159		Canada, Radio Canada Intl	9755am		
0100	0200		Anguilla, Caribbean Beacon	6090am		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek		4910do	
0100	0200		Australia, Radio	9660pa	12080pa	13630pa
			13670va	15415as	15240va	17715as
			17750as	17795pa		
0100	0200		Canada, CFRX Toronto ON	6070do		
0100	0200		Canada, CFVP Calgary AB	6030do		
0100	0200		Canada, CKZN St John's NF	6160do		
0100	0200		Canada, CKZU Vancouver BC	6160do		
0100	0200		China, China Radio Intl	6005na	6020na	
			6075as	9570na	9580na	
0100	0200		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0100	0200		Cuba, Radio Havana	6000na	6060na	
			9820na			
0100	0200		Guyana, Voice of	3291do		
0100	0200		Indonesia, Voice of	9525as	11785pa	
			15150al			
0100	0200		Japan, Radio	6030va	11860as	11935sa
			153235as	17560va	17685oc	17810as
			17825am	17845as		
0100	0200		Malaysia, Radio	7295as		
0100	0200	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0100	0200		Netherlands, Radio	6165na		
0100	0200		New Zealand, Radio NZ Intl	17675pa		
0100	0200	DRM	New Zealand, Radio NZ Intl	15720pa		
0100	0200		North Korea, Voice of	7140as	9345as	
			9730am	11735ca	13760ca	15180ca
0100	0200	vl	Papua New Guinea, Wantok R.Light	7120va		
0100	0200		Singapore, Mediacorp Radio	6150do		
0100	0200		UK, BBC World Service	6195as	9410as	
			11955as	15280as	15310as	15360as
			17790as			
0100	0200		Ukraine, Radio Ukraine Intl	5910na		
0100	0200		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
0100	0200		USA, KAIJ Dallas TX	5755na		
0100	0200		USA, KTBN Salt Lake City UT	7505na		
0100	0200		USA, KWHR Naalehu HI	17655as		
0100	0200		USA, Voice of America	7200va	11820va	
			17740va			
0100	0200		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Birmingham AL	6875va	7540va	
			11870va	13615va		
0100	0200		USA, WHRA Greenbush ME	5850na	5875na	
0100	0200	twhfa	USA, WHRI Noblesville IN	5835am	5860am	
0100	0200	sm	USA, WHRI Noblesville IN	7315am	7490am	
0100	0200		USA, WINB Red Lion PA	9320am		
0100	0200	twhfa	USA, WRMI Miami FL	7385am	9955am	
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCR Nashville TN	3215na	5070na	
			5935na	7465na		
0100	0200		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0100	0200		USA, WYFR Okeechobee FL	6065am	9505am	
			15060va			
0100	0200		Zambia, Christian Voice	4965af		
0115	0130	twhf	Armenia, FEBA	5885eu		
0130	0200		Australia, HCJB	15405as		
0130	0200		Iran, Voice of the Islamic Rep	6120am	9665am	
0130	0200		Sweden, Radio	11550va		
0130	0200	twhfa	USA, Voice of America	7405va	9775va	
			13740va			

0200 UTC - 9PM EST / 8PM CST / 6PM PST

0200	0220		Vatican City, Vatican Radio	7335as	9865as	
0200	0227		Czech Rep, Radio Prague Intl	6200na	7345na	
0200	0228		Hungary, Radio Budapest	9515na		
0200	0230	s	Australia, HCJB	15405as		
0200	0230		Iran, Voice of the Islamic Rep	6120am	9665am	
0200	0300		Anguilla, Caribbean Beacon	6090am		
0200	0300	twhfa	Argentina, RAE	11710na		
0200	0300		Australia, ABC NT Alice Springs		2310irr	
			4835do			

0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek		4910do	
0200	0300		Australia, Radio	9660pa	12080pa	13630pa
			13670va	15415as	15240pa	15515pa
			17750as	21725va		
0200	0300		Canada, CFRX Toronto ON	6070do		
0200	0300		Canada, CFVP Calgary AB	6030do		
0200	0300		Canada, CKZN St John's NF	6160do		
0200	0300		Canada, CKZU Vancouver BC	6160do		
0200	0300		China, China Radio Intl	11770as	13640as	
0200	0300		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0200	0300		Cuba, Radio Havana	6000na	6060na	
			9820na			
0200	0300		Egypt, Radio Cairo 7270na			
0200	0300		Guyana, Voice of 3291do			
0200	0300		Malaysia, Radio 7295as			
0200	0300	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0200	0300		New Zealand, Radio NZ Intl	17675pa		
0200	0300	DRM	New Zealand, Radio NZ Intl	15720pa		
0200	0300		North Korea, Voice of	13650as	15100as	
0200	0300	vl	Papua New Guinea, Wantok R.Light	7120va		
0200	0300		Philippines, Radio Pilipinas	11885va	15270va	
			17665va			
0200	0300		Russia, Voice of 7180na	7250na	7350na	
			15425na	15475na	15595na	
0200	0300		Singapore, Mediacorp Radio	6150do		
0200	0300		South Korea, Radio Korea Intl	9560na	11810sa	
			15575na			
0200	0300		Taiwan, Radio Taiwan Intl	5950na	9680na	
			11875as	15465as		
0200	0300		UK, BBC World Service	5975ca	6195me	
			9750af	9825ca	11955as	12095ca
			15280as	15310as	15360as	17790as
0200	0300		USA, AFRTS 4319usb	5446usb	5765usb	
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
0200	0300		USA, KAIJ Dallas TX	5755na		
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, KTBN Salt Lake City UT	7505na		
0200	0300		USA, KWHR Naalehu HI	17655as		
0200	0300		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0200	0300		USA, WBOH Newport NC	5920am		
0200	0300		USA, WEWN Birmingham AL	6875va	7540va	
			11870va	13615va		
0200	0300		USA, WHRA Greenbush ME	5850na	5875na	
0200	0300	twhfa	USA, WHRI Noblesville IN	5835am	5860am	
0200	0300	sm	USA, WHRI Noblesville IN	7315am	7490am	
0200	0300		USA, WINB Red Lion PA	9320am		
0200	0300	twhfa	USA, WRMI Miami FL	7385am	9955am	
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0200	0300		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0200	0300		USA, WYFR Okeechobee FL	5985va	6065am	
			9505am	11855va		
0200	0300		Zambia, Christian Voice	4965af		
0215	0230		Nepal, Radio 3230as	5005as	6100as	
			7165as			
0230	0300		Sweden, Radio 6010na			
0230	0300		Vietnam, Voice of 6175na			
0245	0300	stwhfa	Albania, Radio Tirana	6115eu	7455eu	
0245	0300		Myanmar, Radio 9730do			
0250	0300		Vatican City, Vatican Radio	7305am	9605am	

0300 UTC - 10PM EST / 9PM CST / 7PM PST

0300	0315	vl	Croatia, Croatian Radio	7285va		
0300	0320		Vatican City, Vatican Radio	7305am	9605am	
0300	0330	mtwhfa	Belarus, Radio 5970eu	6155eu	7210eu	
0300	0330	s	Belarus, Radio 5970eu	6155eu	7210eu	
0300	0330		Egypt, Radio Cairo 7270na			
0300	0330		Myanmar, Radio 9730do			
0300	0330		Philippines, Radio Pilipinas	11885va	15270va	
			17665va			
0300	0330		Thailand, Radio 5890na			
0300	0330		UK, BBC World Service	3255af	5975ca	
			6005af	6190af	6195me	7160as
			11760me	11765af	12035af	15280as
			15310as	17760as	17790as	21660as
0300	0330		USA, KJES Vado NM	7555na		
0300	0330		Vatican City, Vatican Radio	7360af		
0300	0330	vl	Vietnam, Voice of 6175am			
0300	0358		New Zealand, Radio NZ Intl	17675pa		
0300	0358	DRM	New Zealand, Radio NZ Intl	15720pa		
0300	0400		Anguilla, Caribbean Beacon	6090am		
0300	0400		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek		4910do	
0300	0400		Australia, CVC International	13685as		

0300	0400		Australia, Radio	9660pa	12080pa	13630pa
			13670va	15415as	15240pa	15515pa
			17750as	21725va		
0300	0400		Bulgaria, Radio 7400na	9700na		
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070do		
0300	0400		Canada, CFVP Calgary AB	6030do		
0300	0400		Canada, CKZN St John's NF	6160do		
0300	0400		Canada, CKZU Vancouver BC	6160do		
0300	0400		China, China Radio Intl	9690na	9790na	
			15110as	11770as		
0300	0400		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0300	0400		Cuba, Radio Havana	6000na	6060na	
			9820na			
0300	0400		Guyana, Voice of 3291do			
0300	0400		Japan, Radio 21610oc			
0300	0400		Malaysia, Radio 7295as			
0300	0400		Malaysia, Voice of 6175as	9750as	15295as	
0300	0400	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0300	0400		North Korea, Voice of	7140as	9345as	
			9730as			
0300	0400		Oman, Radio Oman	15355as		
0300	0400	vl	Papua New Guinea, Wantok R.Light	7120va		
0300	0400		Russia, Voice of 7180na	7350na	15425na	
			15475na	15595na		
0300	0400	vl	Rwanda, Radio 6055do			
0300	0400		Singapore, Mediacorp Radio	6150do		
0300	0400		South Africa, Channel Africa	3345af	7390af	
0300	0400		Taiwan, Radio Taiwan Intl	5950na	15215sa	
			15320as			
0300	0400	vl	Uganda, Radio 4976do	5026do	7196do	
0300	0400	vl/ mtwhf	UK, Sudan Radio Service	7120va		
0300	0400		USA, AFRTS 4319usb	5446usb	5765usb	
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
0300	0400		USA, KAIJ Dallas TX	5755na		
0300	0400		USA, KTBN Salt Lake City UT	7505na		
0300	0400		USA, KWHR Naalehu HI	17655as		
0300	0400		USA, Voice of America	4930af	6035af	
			6045af	6080af	7290af	7340af
			9885af			
0300	0400		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0300	0400		USA, WBOH Newport NC	5920am		
0300	0400		USA, WEWN Birmingham AL	6875va	7540va	
			11870va	13615va		
0300	0400		USA, WHRA Greenbush ME	5850na	5875na	
0300	0400	twhfa	USA, WHRI Noblesville IN	5835am	5860am	
0300	0400	sm	USA, WHRI Noblesville IN	7315am	7490am	
0300	0400		USA, WINB Red Lion PA	9320am		
0300	0400	twhfa	USA, WRMI Miami FL	7385am	9955am	
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0300	0400		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0300	0400		USA, WYFR Okeechobee FL	6065am	9505am	
			11740va	15255va		
0300	0400		Zambia, Christian Voice	4965af		
0300	0400	vl	Zimbabwe, ZBC Corp	5975do		
0330	0358		Hungary, Radio Budapest	9775eu		
0330	0400	stwhfa	Albania, Radio Tirana	6115eu	7455eu	
0330	0400		Sweden, Radio 6010na			
0330	0400		UK, BBC World Service	3255af	6005af	
			6190af	7160af	11765af	12035af
			15420af			

0400 UTC - 11PM EST / 10PM CST / 8PM PST

0400	0427		Czech Rep, Radio Prague Intl	6100na	7345na	
0400	0430		France, Radio France Intl	7315va	9555va	
			9805va	11995va		
0400	0430		USA, Voice of America	4930af	4960af	
			6080af	7290af	9575af	9775af
			9885af			
0400	0430	vl	Vietnam, Voice of 6175na			
0400	0457		Romania, Radio Romania Intl	6115na	9515na	
			9690as	11895as		
0400	0500		Anguilla, Caribbean Beacon	6090am		
0400	0500		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek		4910do	
0400	0500		Australia, CVC International	13685as		
0400	0500		Australia, Radio	9660pa	12080pa	13670va
			15240pa	15515pa	17750as	21725va
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070do		
0400	0500		Canada, CKZN St John's NF	6160do		
0400	0500		Canada, CKZU Vancouver BC	6160do		
0400	0500		China, China Radio Intl	6190na	9755na	
0400	0500		Costa Rica, University Network	5030va	6150va	

				7375va	9725va		
0400	0500		Cuba, Radio Havana	6000na	6060na		
				9820na			
0400	0500		Germany, Deutsche Welle	6180af	9710af		
				15445af			
0400	0500		Guyana, Voice of	3291do			
0400	0500		Malaysia, Radio	7295as			
0400	0500		Malaysia, Voice of	6175as	9750as	15295as	
0400	0500	vl	Namibia, Namibian BC Corp	3270do	3290do		
				6060do	6175do		
0400	0500		New Zealand, Radio NZ Intl	15720pa			
0400	0500	DRM	New Zealand, Radio NZ Intl	13690pa			
0400	0500		Nigeria, Radio/Kaduna	6090do			
0400	0500	vl	Papua New Guinea, Wantok R.Light	7120va			
0400	0500		Russia, Voice of	7150na	7180na	7350na	
				9840na	12010na	15475na	
0400	0500	DRM	Russia, Voice of	15595na			
0400	0500	vl	Rwanda, Radio	6055do			
0400	0500		Singapore, Mediacorp Radio	6150do			
0400	0500		South Africa, Channel Africa	7390af			
0400	0500		Turkey, Voice of	6020va	7240va		
0400	0500	vl	Uganda, Radio	4976do	5026do	7196do	
0400	0500		UK, BBC World Service	3255af	6005af		
				6195eu	7130eu	7160af	11760me
				11765af	12035af	15280as	15310as
				15575me	15420af	17760as	17790as
				21660as			
0400	0500	DRM	UK, BBC World Service	6010na			
0400	0500	vl/ mtwhf	UK, Sudan Radio Service	7120va			
0400	0500		Ukraine, Radio Ukraine Intl	5910na			
0400	0500		USA, AFRTS	4319usb	5446usb	5765usb	
				7590usb	7812usb	12133usb	12579usb
				12133usb	12579usb	13362usb	13855usb
0400	0500		USA, KAIJ Dallas TX	5755na			
0400	0500		USA, KTBN Salt Lake City UT	7505na			
0400	0500		USA, KWHR Naalehu HI	17655as			
0400	0500		USA, WBCQ Kennebunk ME	5110na	7415na		
				9330na			
0400	0500		USA, WBOH Newport NC	5920am			
0400	0500		USA, WEWN Birmingham AL	6875va	7540va		
				11870va	13615va		
0400	0500		USA, WHRA Greenbush ME	5850na	5875na		
0400	0500	twhfa	USA, WHRI Noblesville IN	6100am	7315am		
0400	0500	sm	USA, WHRI Noblesville IN	7315am	7490am		
0400	0500		USA, WMLK Bethel PA	9265eu	9955eu		
0400	0500	twhfa	USA, WRMI Miami FL	7385am	9955am		
0400	0500		USA, WTJC Newport NC	9370na			
0400	0500		USA, WWCR Nashville TN	3215na	5070na		
				5765na	5935na		
0400	0500		USA, WWRB Manchester TN	3185na	5050na		
				5745na	6890na		
0400	0500		USA, WYFR Okeechobee FL	6065am	6855am		
				7780va	9505am	9715am	
0400	0500		Zambia, Christian Voice	6065af			
0400	0500	vl	Zimbabwe, ZBC Corp	5975do			
0430	0445		Israel, Kol Israel	6280va	7545va	15640va	
				17600va			
0430	0500		Australia, Radio	15415as			
0430	0500		Czech Rep, Radio Prague Intl	9885va	11600va		
0430	0500		Nigeria, Radio/Ibadan	6050do			
0430	0500		Nigeria, Radio/Kaduna	4770do			
0430	0500		Nigeria, Radio/Lagos	3326do	4990do		
0430	0500		Swaziland, TWR	3200af	4775af		
0430	0500		USA, Voice of America	4930af	4960af		
				9575af	9775af		
0445	0500		Italy, RAI Intl	5965af	6120af	7170af	

0500 UTC - 12AM EST / 11PM CST / 9PM PST

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na			
0500	0530		France, Radio France Intl	11850va	11995va		
				15155va			
0500	0530	vl	Rwanda, Radio	6055do			
0500	0530		UK, BBC World Service	6005af	6190af		
				7160af	11765af	11955af	15280as
				15310as	15420af	17640af	17760as
				17790as	21660as		
0500	0530		Vatican City, Vatican Radio	7360af	9660af		
				11625af			
0500	0600		Anguilla, Caribbean Beacon	6090am			
0500	0600		Australia, ABC NT Alice Springs		2310irr		
				4835do			
0500	0600		Australia, ABC NT Katherine	5025do			
0500	0600		Australia, ABC NT Tennant Creek		4910do		
0500	0600		Australia, CVC International	13685as			
0500	0600		Australia, Radio	9660pa	12080pa	13630pa	
				13670pa	15160va	15240pa	15515pa
				17750as			
0500	0600		Bhutan, BBS	6035as			
0500	0600		Canada, CFRX Toronto ON	6070do			
0500	0600		Canada, CKZN St John's NF	6160do			
0500	0600		Canada, CKZU Vancouver BC	6160do			
0500	0600		China, China Radio Intl	5960na	6190na		
				7220af	9590af	11880af	15350as

				15465as	17505va	17540as	
0500	0600		Costa Rica, University Network	5030va	6150va		
				7375va	9725va		
0500	0600		Cuba, Radio Havana	6000va	6060va		
				9550va	9820va	11760va	
0500	0600		Germany, Deutsche Welle	7285af	9565af		
				12035af	15410af		
0500	0600		Guyana, Voice of	3291do			
0500	0600		Japan, Radio	5975eu	6110na	7230eu	
				15195as	17810as	21755oc	
0500	0600		Malaysia, Radio	7295as			
0500	0600		Malaysia, Voice of	6175as	9750as	15295as	
0500	0600	vl	Namibia, Namibian BC Corp	3270do	3290do		
				6060do	6175do		
0500	0600		Netherlands, Radio	6165na	11710oc		
0500	0600		New Zealand, Radio NZ Intl	15720pa			
0500	0600	DRM	New Zealand, Radio NZ Intl	13690pa			
0500	0600		Nigeria, Radio/Ibadan	6050do			
0500	0600		Nigeria, Radio/Kaduna	4770do	6090do		
0500	0600		Nigeria, Radio/Lagos	3326do	4990do		
0500	0600		Nigeria, Voice of	7255af			
0500	0600	vl	Papua New Guinea, Wantok R.Light	7120va			
0500	0600		Russia, Voice of	7150na	7180na	12010na	
				15425na			
0500	0600		Singapore, Mediacorp Radio	6150do			
0500	0600		South Africa, Channel Africa	7240af	11875af		
0500	0600		Swaziland, TWR	3200af	4775af	9500af	
0500	0600	vl	Uganda, Radio	4976do	5026do	7196do	
0500	0600		UK, BBC World Service	6195va	9410va		
				11760me	12095eu	15575me	
0500	0600		UK, CVC International	9430af			
0500	0600	vl/ mtwhf	UK, Sudan Radio Service	9525va			
0500	0600		USA, AFRTS	4319usb	5446usb	5765usb	
				7590usb	7812usb	12133usb	12579usb
				12133usb	12579usb	13362usb	13855usb
0500	0600		USA, KAIJ Dallas TX	5755na			
0500	0600		USA, KTBN Salt Lake City UT	7505na			
0500	0600		USA, KWHR Naalehu HI	11565as	15610as		
0500	0600		USA, Voice of America	4930af	6035af		
				6080af	6105af	7295af	13710af
0500	0600		USA, WBCQ Kennebunk ME	5110na	7415na		
				9330na			
0500	0600		USA, WBOH Newport NC	5920am			
0500	0600		USA, WEWN Birmingham AL	5850va	7540va		
				7570va	11870va		
0500	0600		USA, WHRA Greenbush ME	5875na	7555na		
0500	0600	twhfa	USA, WHRI Noblesville IN	6100am	7315am		
0500	0600	sm	USA, WHRI Noblesville IN	7315am	7490am		
0500	0600		USA, WMLK Bethel PA	9265eu	9955eu		
0500	0600	twhfa	USA, WRMI Miami FL	7385am			
0500	0600		USA, WTJC Newport NC	9370na			
0500	0600		USA, WWCR Nashville TN	3215na	5070na		
				5765na	5935na		
0500	0600		USA, WWRB Manchester TN	3185na			
0500	0600		USA, WYFR Okeechobee FL	6855am	9355af		
0500	0600		Zambia, Christian Voice	6065af			
0500	0600	vl	Zimbabwe, ZBC Corp	5975do			
0525	0600	vl	Ghana, Ghana BC Corp	3366do	4915do		
0530	0600		Australia, Radio	15415as			
0530	0600		Thailand, Radio	13770eu			
0530	0600	mtwhf	UK, BBC World Service	17885af			
0530	0600		UK, BBC World Service	11955as	15310as		
				15360as	17760as	17790as	21660as
0545	0600	vl	Rwanda, Radio	6055do			

0600 UTC - 1AM EST / 12AM CST / 10PM PST

0600	0615as		South Africa, TWR	11640af			
0600	0630		UK, BBC World Service	6005af	6190af		
				6195af	7160af	9410af	11765af
				11940af	17640af		
0600	0630		USA, Voice of America	4930af	6035af		
				6080af	6105af	7295af	11835af
				11995af	13710af		
0600	0630		Vatican City, Vatican Radio	4005af	5885eu		
				7250eu			
0600	0645	mtwhf	South Africa, TWR	11640af			
0600	0658		France, Radio France Intl	9865af	15155af		
				17800af			
0600	0700		Anguilla, Caribbean Beacon	6090am			
0600	0700		Australia, ABC NT Alice Springs		2310irr		
				4835do			
0600	0700		Australia, ABC NT Katherine	5025do			
0600	0700		Australia, ABC NT Tennant Creek		4910do		
0600	0700		Australia, CVC International	15355as			
0600	0700		Australia, Radio	9660pa	11880pa	12080pa	
				13630pa	13670va	15160pa	15240pa
				15415as	15515pa	17750as	
0600	0700		Canada, CFRX Toronto ON	6070do			
0600	0700		Canada, CFVP Calgary AB	6030do			
0600	0700		Canada, CKZN St John's NF	6160do			
0600	0700		Canada, CKZU Vancouver BC	6160do			
0600	0700		China, China Radio Intl	6115na	9590af		
				11750af	11880as	15140as	15465as

Start	Stop	Days	Station	Freq	Freq	Freq
				17540as	17540va	
0600	0700		Costa Rica, University Network	5030va	6150va	
			7375va	9725va	11870va	
0600	0700		Cuba, Radio Havana	6000va	6060va	
			9550va	9820va	11760va	
0600	0700		Germany, Deutsche Welle	6140eu	7225af	
			11785af	15440af		
0600	0700	vl	Ghana, Ghana BC Corp	3366do	4915do	
0600	0700		Guyana, Voice of	3291do		
0600	0700		Japan, Radio	7230eu	11690am	11715as
			11740as	11760as	15195as	17870oc
0600	0700		Liberia, ELWA	4760do		
0600	0700		Malaysia, Radio	7295as		
0600	0700		Malaysia, Voice of	6175as	9750as	15295as
0600	0700	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0600	0700		New Zealand, Radio NZ Intl	15720pa		
0600	0700	DRM	New Zealand, Radio NZ Intl	13690pa		
0600	0700		Nigeria, Radio/Ibadan	6050do		
0600	0700		Nigeria, Radio/Kaduna	4770do	6090do	
0600	0700		Nigeria, Radio/Lagos	3326do	4990do	
0600	0700		Nigeria, Voice of	7255af		
0600	0700	vl	Papua New Guinea, Wantok R.Light	7120va		
0600	0700		Russia, Voice of	17665oc	17805oc	
0600	0700	irreg/ vl	Sierra Leone, SLBS	3316do		
0600	0700		Singapore, Mediacorp Radio	6150do		
0600	0700	vl	Solomon Islands, SIBC	5020do	9545do	
0600	0700		South Africa, Channel Africa	7240af	15255af	
0600	0700		Swaziland, TWR	4775af	6120af	9500af
0600	0700	as	UK, BBC World Service	17885af		
0600	0700		UK, BBC World Service	6195eu	9410eu	
			11955as	12095eu	15310as	15360as
			15565eu	15575me	17760me	17790as
0600	0700		UK, CVC International	9430af		
0600	0700		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
0600	0700		USA, KAIJ Dallas TX	5755na		
0600	0700		USA, KTBN Salt Lake City UT	7505na		
0600	0700		USA, KWHR Naalehu HI	11565as	15610as	
0600	0700		USA, WBCQ Kennebunk ME	5110na	7415na	
0600	0700		USA, WBOH Newport NC	5920am		
0600	0700		USA, WEWN Birmingham AL	5850va	7540va	
			11870va			
0600	0700		USA, WHRA Greenbush ME	6135na	7555na	
0600	0700	thas	USA, WHRI Noblesville IN	5860am	5875am	
			6125am			
0600	0700	smtw	USA, WHRI Noblesville IN	7315sa		
0600	0700		USA, WMLK Bethel PA	9265eu	9955eu	
0600	0700	twhfa	USA, WRMI Miami FL	7385am		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR Okeechobee FL	5810va	7780va	
			11530af	11580va		
0600	0700	vl	Vanuatu, Radio	4960do		
0600	0700		Yemen, Rep of Yemen Radio	9780me		
0600	0700		Zambia, Christian Voice	6065af		
0600	0700	vl	Zimbabwe, ZBC Corp	5975do		
0605	0630	s	Austria, Radio Austria Intl	17870me		
0630	0657		Romania, Radio Romania Intl	7180eu	9690eu	
			15135pa	17780pa		
0630	0700		UK, BBC World Service	6005af	6190af	
			6195va	7160af	9410af	11765af
			11940af	15400af	17640af	
0630	0700	as	UK, BBC World Service	17885af		
0630	0700		USA, Voice of America	6080af	7295af	
			11835af			
0630	0700		Vatican City, Vatican Radio	9660af	11625af	
			13765af			
0630	0700		Vatican City, Vatican Radio	9660af	11625af	
			13765af			

0700 UTC - 2AM EST / 1AM CST / 11PM PST

Start	Stop	Days	Station	Freq	Freq	Freq
0700	0710		Vatican City, Vatican Radio	4005eu	5885eu	
			6185eu	7250eu	9645eu	11740eu
			15595eu			
0700	0715		UK, BBC World Service	6005af	6190af	
			9410af	11765af	11940af	12095af
			15400af	15485af	17640af	17830af
0700	0715	as	UK, BBC World Service	17885af		
0700	0730		Slovakia, Radio Slovakia Intl	13715pa	15460pa	
0700	0730		UK, BBC World Service	11760me	15575me	
0700	0745		USA, WYFR Okeechobee FL	7780va		
0700	0759		New Zealand, Radio NZ Intl	15720pa		
0700	0759	DRM	New Zealand, Radio NZ Intl	13690pa		
0700	0800		Anguilla, Caribbean Beacon	6090am		
0700	0800		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek		4910do	
0700	0800		Australia, CVC International	15355as		
0700	0800		Australia, HCJB	11750pa		
0700	0800		Australia, Radio	9660pa	9710pa	11880pa
			12080pa	13630pa	15160pa	15240pa
			15415as	17750as		
0700	0800		Canada, CFRX Toronto ON	6070do		
0700	0800		Canada, CFVP Calgary AB	6030do		
0700	0800		Canada, CKZN St John's NF	6160do		
0700	0800		Canada, CKZU Vancouver BC	6160do		
0700	0800		China, China Radio Intl	11785eu	11880as	
			15350as	15465as	17490eu	17540as
0700	0800		Costa Rica, University Network	5030va	6150va	
			7375va	9725va	11870va	
0700	0800		Eqt Guinea, Radio Africa	15190af		
0700	0800		France, Radio France Intl	11725af	11725af	
0700	0800		Germany, Deutsche Welle	6140eu		
0700	0800	vl	Ghana, Ghana BC Corp	3366do	4915do	
0700	0800		Guyana, Voice of	3291do	5950do	
0700	0800		Liberia, ELWA	4760do		
0700	0800		Liberia, Star Radio	9525af		
0700	0800		Malaysia, Radio	7295as		
0700	0800		Malaysia, Voice of	6175as	9750as	15295as
0700	0800		Myanmar, Radio	9730do		
0700	0800	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0700	0800		Nigeria, Radio/Ibadan	6050do		
0700	0800		Nigeria, Radio/Kaduna	4770do	6090do	
0700	0800		Nigeria, Radio/Lagos	3326do	4990do	
0700	0800	vl	Papua New Guinea, Wantok R.Light	7120va		
0700	0800		Russia, Voice of	17665oc	17805oc	
0700	0800	irreg/ vl	Sierra Leone, SLBS	3316do		
0700	0800		Singapore, Mediacorp Radio	6150do		
0700	0800	vl	Solomon Islands, SIBC	5020do	9545do	
0700	0800	vl	South Africa, Channel Africa	11825af		
0700	0800		Swaziland, TWR	4775af	6120af	9500af
0700	0800		Taiwan, Radio Taiwan Intl	5950na		
0700	0800		UK, BBC World Service	9410eu	11955as	
			12095eu	15310as	15360as	15565eu
			17760as	17790as	21660me	
0700	0800		UK, CVC International	15640eu		
0700	0800		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
0700	0800		USA, KAIJ Dallas TX	5755na		
0700	0800		USA, KTBN Salt Lake City UT	7505na		
0700	0800		USA, KWHR Naalehu HI	11565as	15610as	
0700	0800		USA, WBCQ Kennebunk ME	5110na	7415na	
0700	0800		USA, WBOH Newport NC	5920am		
0700	0800		USA, WEWN Birmingham AL	5850va	7540va	
			11870va			
0700	0800		USA, WHRA Greenbush ME	6135na	7465na	
0700	0800		USA, WHRI Noblesville IN	5860am	5875am	
			7315sa			
0700	0800		USA, WMLK Bethel PA	9265eu	9955eu	
0700	0800	twhfa	USA, WRMI Miami FL	7385am		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR Okeechobee FL	5985am	6855am	
			7355va	9505va	9715am	9930af
0700	0800	vl	Vanuatu, Radio	4960do		
0700	0800		Zambia, Christian Voice	6065af		
0715	0800		UK, BBC World Service	6190af	9410af	
			11765af	11940af	12095af	15400af
			15485af	17640af	17830af	
0715	0800	as	UK, BBC World Service	17885af		
0730	0745		Vatican City, Vatican Radio	4005va	5885va	
			6185va	7250va	9645va	11740va
			15595va			
0730	0800		Bulgaria, Radio	9500eu	11500eu	
0730	0800	as	Germany, Bible Voice Broadcasting		5945eu	
0730	0800	as	Guam, TWR/KTWR	15255as		
0730	0800		UK, BBC World Service	11760me	15575me	
0740	0800	mtwhf	Guam, TWR/KTWR	15225as		
0745	0800	s	Albania, TWR	11865eu		
0745	0800	s	Albania, TWR	11865eu		
0745	0800	s	Monaco, TWR	9800eu		

0800 UTC - 3AM EST / 2AM CST / 12AM PST

Start	Stop	Days	Station	Freq	Freq	Freq
0800	0827		Czech Rep, Radio Prague Intl	7345eu	9860eu	
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek		4910do	
0800	0830		Liberia, ELWA	4760do		
0800	0830		Malaysia, Voice of	6175as	9750as	
0800	0830		Myanmar, Radio	9730do		
0800	0830		Swaziland, TWR	4775af	6120af	9500af
0800	0900	mtwhf	Albania, TWR	11865eu		
0800	0900		Anguilla, Caribbean Beacon	6090am		
0800	0900		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0800	0900		Australia, CVC International	15355as		
0800	0900		Australia, HCJB	11750pa		
0800	0900		Australia, Radio	5995pa	9580pa	9590pa

Start	Stop	Note	Station	Freq 1	Freq 2	Freq 3	Freq 4
				9710pa	12080pa	13630pa	15240as
				17750as			
0800	0900		Bhutan, BBS	6035as			
0800	0900		Canada, CFRX Toronto ON	6070do			
0800	0900		Canada, CFVP Calgary AB	6030do			
0800	0900		Canada, CKZN St John's NF	6160do			
0800	0900		Canada, CKZU Vancouver BC	6160do			
0800	0900		China, China Radio Intl	11785eu	11880as		
				15350as	15465as	17490eu	17540as
0800	0900		Costa Rica, University Network	5030va	6150va		
				7375va	9725va	11870va	
0800	0900		Eqt Guinea, Radio Africa	15190af			
0800	0900	as	Germany, Bible Voice Broadcasting		5945eu		
0800	0900		Germany, Deutsche Welle	6140eu			
0800	0900	DRM	Germany, Deutsche Welle	21675af			
0800	0900	vl	Ghana, Ghana BC Corp	3366do	4915do		
0800	0900	mtwhf	Guam, TWR/KTWR	11840as	15225as		
0800	0900		Guyana, Voice of	3291do	5950do		
0800	0900		Indonesia, Voice of	9525as	11785pa		
				15150al			
0800	0900	vl/as	Italy, IRRS	13840va			
0800	0900		Liberia, Star Radio	9525af			
0800	0900		Malaysia, Radio	7295as			
0800	0900		Malaysia, Voice of	15295as			
0800	0900	mtwhf	Monaco, TWR	9800eu			
0800	0900		New Zealand, Radio NZ Intl	9885pa			
0800	0900	DRM	New Zealand, Radio NZ Intl	9460pa			
0800	0900		Nigeria, Radio/Ibadan	6050do			
0800	0900		Nigeria, Radio/Kaduna	4770do	6090do		
0800	0900		Nigeria, Radio/Lagos	3326do	4990do		
0800	0900		Papua New Guinea, Catholic Radio	4960do			
0800	0900		Papua New Guinea, NBC	4890do			
0800	0900	vl	Papua New Guinea, Wantok R.Light	7120va			
0800	0900		Russia, Voice of	17495oc	17665oc	17805oc	
0800	0900	irreg/ vl	Sierra Leone, SLBS	3316do			
0800	0900		Singapore, Mediacorp Radio	6150do			
0800	0900	vl	Solomon Islands, SIBC	5020do	9545do		
0800	0900	s	South Africa, Radio League	7205af	17700af		
0800	0900		South Korea, Radio Korea Intl	9570as	9640eu		
0800	0900		Taiwan, Radio Taiwan Intl	9610va			
0800	0900		UK, BBC World Service	6190af	6195as		
				9740as	11760me	11940af	15280as
				15310as	15360as	15400af	15485af
				15575me	17640af		
0800	0900		UK, CVC International	15640af			
0800	0900		USA, AFRTS	4319usb	5446usb	5765usb	
				7590usb	7812usb	12133usb	12579usb
				12133usb	12579usb	13362usb	13855usb
0800	0900		USA, KAIJ Dallas TX	5755na			
0800	0900		USA, KNLS Anchor Point AK	9615as			
0800	0900		USA, KTBN Salt Lake City UT	7505na			
0800	0900		USA, KWHR Naalehu HI	9930as	11565as		
0800	0900		USA, WBOH Newport NC	5920am			
0800	0900		USA, WEWN Birmingham AL	5850na	7540na		
				11870va			
0800	0900		USA, WHRA Greenbush ME	6135na	7465na		
0800	0900		USA, WHRI Noblesville IN	5860am	5875am		
				7315sa			
0800	0900		USA, WMLK Bethel PA	9265eu	9955eu		
0800	0900	twhfa	USA, WRMI Miami FL	7385am			
0800	0900		USA, WTJC Newport NC	9370na			
0800	0900		USA, WWCR Nashville TN	3215na	5070na		
				5765na	5935na		
0800	0900		USA, WWRB Manchester TN	3185na			
0800	0900		USA, WYFR Okeechobee FL	5950am	5745am		
				5985am	6855af	9930af	
0800	0900	vl	Vanuatu, Radio	4960do			
0800	0900		Zambia, Christian Voice	6065af			
0815	0850	a	Albania, TWR	11865eu			
0815	0850	a	Monaco, TWR	9800eu			
0815	0900	f	Germany, Bible Voice Broadcasting		5945eu		
0815	0900	as	Guam, TWR/KTWR	11840as			
0830	0900		Australia, ABC NT Katherine	2485do			
0830	0900		Australia, ABC NT Tennant Creek		2325do		
0830	0900		Australia, Radio	15415as			

0900 UTC - 4AM EST / 3AM CST / 1AM PST

Start	Stop	Note	Station	Freq 1	Freq 2	Freq 3	Freq 4
0900	0900		USA, WBCQ Kennebunk ME	5110na	7415na		
0900	0915	a	Germany, Bible Voice Broadcasting		5945eu		
0900	0915	vl	Ghana, Ghana BC Corp	3366do	4915do		
0900	0920	mtwhf	Albania, TWR	11865eu			
0900	0920	s	Albania, TWR	11865eu			
0900	0920	s	Monaco, TWR	9800eu			
0900	0930	mtwhf	Guam, TWR/KTWR	11840eu			
0900	0945	s	Germany, Bible Voice Broadcasting		5945eu		
0900	1000		Anguilla, Caribbean Beacon	6090am			
0900	1000		Australia, ABC NT Alice Springs		2310do		
				4835irr			
0900	1000		Australia, ABC NT Katherine	2485do			
0900	1000		Australia, ABC NT Tennant Creek		2325do		
0900	1000		Australia, CVC International	11955as			
0900	1000		Australia, Radio	9580pa	9590pa	11880as	
				15240as			

Start	Stop	Note	Station	Freq 1	Freq 2	Freq 3	Freq 4
0900	1000		Canada, CFRX Toronto ON	6070do			
0900	1000		Canada, CFVP Calgary AB	6030do			
0900	1000		Canada, CKZN St John's NF	6160do			
0900	1000		Canada, CKZU Vancouver BC	6160do			
0900	1000		China, China Radio Intl	15210pa	17490eu		
				17690eu			
0900	1000		Costa Rica, University Network	5030va	6150va		
				7375va	9725va	11870va	13750va
0900	1000		Eqt Guinea, Radio Africa	15190af			
0900	1000		Germany, Deutsche Welle	6140eu			
0900	1000	DRM/vl	Germany, Deutsche Welle	21675af			
0900	1000		Guyana, Voice of	3291do	5950do		
0900	1000	vl/as	Italy, IRRS	13840va			
0900	1000	a	Italy, IRRS	15725va			
0900	1000		Malaysia, Radio	7295as			
0900	1000	vl	Namibia, Namibian BC Corp	3270do	3290do		
				6060do	6175do		
0900	1000		New Zealand, Radio NZ Intl	9885pa			
0900	1000	DRM	New Zealand, Radio NZ Intl	9460pa			
0900	1000		Nigeria, Radio/Ibadan	6050do			
0900	1000		Nigeria, Radio/Kaduna	4770do	6090do		
0900	1000		Nigeria, Radio/Lagos	3326do	4990do		
0900	1000		Papua New Guinea, Catholic Radio		4960do		
0900	1000		Papua New Guinea, NBC	4890do			
0900	1000	vl	Papua New Guinea, Wantok R.Light		7120va		
0900	1000		Russia, Voice of	17495oc	17665oc		
0900	1000	DRM	Russia, Voice of	12060eu			
0900	1000	vl	Rwanda, Radio	6055do			
0900	1000	irreg/ vl	Sierra Leone, SLBS	3316do			
0900	1000		Singapore, Mediacorp Radio	6150do			
0900	1000	vl	Solomon Islands, SIBC	5020do	9545do		
0900	1000		UK, BBC World Service	6190af	6195as		
				9605as	9740as	11760me	11940af
				15280as	15310as	15360as	15400af
				15485af	15575me	17640af	17830af
				17760as	17790as	17885af	21470af
				21660as			
0900	1000		USA, AFRTS	4319usb	5446usb	5765usb	
				7590usb	7812usb	12133usb	12579usb
				12133usb	12579usb	13362usb	13855usb
0900	1000		USA, KAIJ Dallas TX	5755na			
0900	1000		USA, KTBN Salt Lake City UT	7505na			
0900	1000		USA, KWHR Naalehu HI	9930as	11565as		
0900	1000		USA, Voice of America	15615va			
0900	1000		USA, WBCQ Kennebunk ME	5110na	7415na		
0900	1000		USA, WBOH Newport NC	5920am			
0900	1000		USA, WEWN Birmingham AL	5850na	7540na		
				11870va			
0900	1000		USA, WHRA Greenbush ME	6135na			
0900	1000		USA, WHRI Noblesville IN	5875am	7315sa		
				7520am			
0900	1000		USA, WRMI Miami FL	9955am			
0900	1000		USA, WTJC Newport NC	9370na			
0900	1000		USA, WWCR Nashville TN	3215na	5070na		
				5765na	5935na		
0900	1000		USA, WWRB Manchester TN	3185na			
0900	1000		USA, WYFR Okeechobee FL	5745am	5985am		
				6885as	9450as	9755am	
0900	1000	vl	Vanuatu, Radio	4960do			
0900	1000		Zambia, Christian Voice	9865af			
0930	1000		Australia, Radio	15415as			

1000 UTC - 5AM EST / 4AM CST / 2AM PST

Start	Stop	Note	Station	Freq 1	Freq 2	Freq 3
1000	1029		Czech Rep, Radio Prague Intl	21745va		
1000	1030		Australia, CVC International	11955as		
1000	1030		Mongolia, Voice of	12085as		
1000	1059		New Zealand, Radio NZ Intl	9885pa		
1000	1059	DRM	New Zealand, Radio NZ Intl	9460pa		
1000	1100		Anguilla, Caribbean Beacon	11775am		
1000	1100		Australia, ABC NT Alice Springs		2310do	
				4835irr		
1000	1100		Australia, ABC NT Katherine	2485do		
1000	1100		Australia, ABC NT Tennant Creek		2325do	
1000	1100		Australia, Radio	9580pa	9590pa	11880as
				15240as	15415as	
1000	1100		Canada, CFRX Toronto ON	6070do		
1000	1100		Canada, CFVP Calgary AB	6030do		
1000	1100		Canada, CKZN St John's NF	6160do		
1000	1100		Canada, CKZU Vancouver BC	6160do		
1000	1100		China, China Radio Intl	15210pa	17490eu	
				17690pa		
1000	1100		Costa Rica, University Network	5030va	6150va	
				7375va	9725va	11870va
1000	1100	DRM/vl	Germany, Deutsche Welle	6140eu		
1000	1100		Guyana, Voice of	3291do	5950do	
1000	1100		India, All India Radio	13710oc	15020as	
				15260as	15235as	17510oc	17800as
				17895oc		
1000	1100	a	Italy, IRRS	15725va		
1000	1100	vl/as	Italy, IRRS	13840va		
1000	1100		Japan, Radio	6120na	9695as	11730as
				17585eu	17720va	21755oc
1000	1100	DRM	Luxembourg, Radio	7145eu		

Start	End	Notes	Station				
1000	1100		Malaysia, Radio	7295as			
1000	1100		Malaysia, Voice of	6175as	15295as		
1000	1100		Netherlands, Radio	7315as	9795as		
			12065va				
1000	1100		Nigeria, Voice of	7255af			
1000	1100		North Korea, Voice of	6185as	6285am		
			9335ca	9850as			
1000	1100		Papua New Guinea, Catholic Radio	4960do			
1000	1100		Papua New Guinea, NBC	4890do			
1000	1100	vl	Papua New Guinea, Wantok R.Light	7120va			
1000	1100		Singapore, Mediacorp Radio	6150do			
1000	1100	vl	Solomon Islands, SIBC	5020do	9545do		
1000	1100	vl	South Africa, Channel Africa	11825af			
1000	1100		UK, BBC World Service	6190af	6195va		
			9605as	9740as	11760me	11940af	
			15280as	15310as	15360as	15485af	
			15575me	17640af	17790me	17885af	
			21470af				
1000	1100	as	UK, BBC World Service	15400af	17830af		
1000	1100		USA, AFRTS	4319usb	5446usb	5765usb	
			7590usb	7812usb	12133usb	12579usb	
			12133usb	12579usb	13362usb	13855usb	
1000	1100		USA, KAIJ Dallas TX	5755na			
1000	1100		USA, KNLS Anchor Point AK	9615as			
1000	1100		USA, KTBN Salt Lake City UT	7505na			
1000	1100		USA, KWHR Naalehu HI	9930as	11565as		
1000	1100		USA, Voice of America	15615va			
1000	1100		USA, WBCQ Kennebunk ME	5110na			
1000	1100		USA, WBOH Newport NC	5920am			
1000	1100		USA, WEWN Birmingham AL	5850na	7540na		
			11870va				
1000	1100		USA, WHRA Greenbush ME	6135na			
1000	1100		USA, WHRI Noblesville IN	6095am	7520am		
			9495am				
1000	1100		USA, WRMI Miami FL	9955am			
1000	1100		USA, WTJC Newport NC	9370na			
1000	1100		USA, WWCR Nashville TN	5070na	5765na		
			5935na	9985na	15825na		
1000	1100		USA, WWRB Manchester TN	3185na			
1000	1100		USA, WYFR Okeechobee FL	5950am	5985am		
			6000am	6855am	9450as		
1000	1100		Zambia, Christian Voice	9865af			
1030	1045	mtwhf	Ethiopia, Radio	5990af	7110af	9704af	
1030	1045		Israel, Kol Israel	15640va	17535va		
1030	1100		Australia, HCJB	15400as			
1030	1100	s	Germany, Bible Voice Broadcasting	5895as			
1030	1100		Iran, Voice of the Islamic Rep	15460as	15480as		
1030	1100		UK, BBC World Service	6195as	9740as		
			11945as	15310as	17790as		

1100 UTC - 6AM EST / 5AM CST / 3AM PST

Start	End	Notes	Station				
1100	1130		Australia, HCJB	15400as			
1100	1130		Australia, Radio	15240as			
1100	1130		Iran, Voice of the Islamic Rep	15460as	15480as		
1100	1130		UK, BBC World Service	6190af	6195as		
			9740as	11760me	11855ca	11940af	
			11945as	15310as	15400af	15485af	
			15575me	17640af	17790as		
1100	1159		Germany, Overcomer Ministries	6110eu			
			9855eu				
1100	1159	s	Germany, Universal Life	6055me			
1100	1200		Anguilla, Caribbean Beacon	11775am			
1100	1200		Australia, ABC NT Alice Springs	2310do			
			4835irr				
1100	1200		Australia, ABC NT Katherine	2485do			
1100	1200		Australia, ABC NT Tennant Creek	2325do			
1100	1200		Australia, CVC International	13635as			
1100	1200		Australia, Radio	5995pa	6020pa	9475as	
			9560as	9580pa	9590pa	11880as	
			12080pa				
1100	1200	as	Canada, CBC NQ SW Service	9625na			
1100	1200		Canada, CFRX Toronto ON	6070do			
1100	1200		Canada, CFVP Calgary AB	6030do			
1100	1200		Canada, CKZN St John's NF	6160do			
1100	1200		Canada, CKZU Vancouver BC	6160do			
1100	1200		China, China Radio Intl	5960na	13665eu		
			17490eu				
1100	1200		Costa Rica, University Network	5030va	6150va		
			7375va	9725va	11870va	13750va	
1100	1200		Ecuador, HCJB	12005am	21455am		
1100	1200	DRM/vl	Germany, Deutsche Welle	6140eu			
1100	1200	a	Italy, IRRS	15725va			
1100	1200	vl/as	Italy, IRRS	13840va			
1100	1200		Japan, Radio	9695as	11730as		
1100	1200	DRM	Luxembourg, Radio	7145eu			
1100	1200		Malaysia, Radio	7295as			
1100	1200		Malaysia, Voice of	6175as	15295as		
1100	1200	DRM	Netherlands, Radio	7240na			
1100	1200		New Zealand, Radio NZ Intl	15530pa			
1100	1200	DRM	New Zealand, Radio NZ Intl	9460pa			
1100	1200		Nigeria, Voice of	7255af			
1100	1200		Papua New Guinea, Catholic Radio	4960do			
1100	1200		Papua New Guinea, NBC	4890do			
1100	1200	vl	Papua New Guinea, Wantok R.Light	7120va			
1100	1200		Singapore, Radio Singapore Intl	6080as			
			6150as				
1100	1200	vl	South Africa, Channel Africa	11825af			
1100	1200		Taiwan, Radio Taiwan Intl	7445as			
1100	1200		USA, AFRTS	4319usb	5446usb	5765usb	
			7590usb	7812usb	12133usb	12579usb	
			12133usb	12579usb	13362usb	13855usb	
1100	1200		USA, KAIJ Dallas TX	5755na			
1100	1200		USA, KTBN Salt Lake City UT	7505na			
1100	1200		USA, KWHR Naalehu HI	9930as	11565as		
1100	1200		USA, Voice of America	13865va	15615va		
			17555va				
1100	1200		USA, WBOH Newport NC	5920am			
1100	1200		USA, WEWN Birmingham AL	5850na	7540na		
			11870na				
1100	1200		USA, WHRA Greenbush ME	6135na			
1100	1200		USA, WHRI Noblesville IN	6095am	7520am		
			9495am				
1100	1200		USA, WINB Red Lion PA	9320am			
1100	1200		USA, WRMI Miami FL	9955am			
1100	1200		USA, WTJC Newport NC	9370na			
1100	1200		USA, WWCR Nashville TN	5070na	5765na		
			5935na	9985na	15825na		
1100	1200		USA, WWRB Manchester TN	3185na			
1100	1200		USA, WWRB Manchester TN	3185na			
1100	1200		USA, WYFR Okeechobee FL	5950am	5985am		
			6000am	7780va	9550va	9625va	
			9755am				
1100	1200		Zambia, Christian Voice	9865af			
1105	1200		Greece, Voice of	12105eu	15630eu	17525eu	
1130	1157		Czech Rep, Radio Prague Intl	11640eu	21745va		
1130	1159	a	Germany, Universal Life	6055me			
1130	1200		Australia, HCJB	15425as			
1130	1200	a	Germany, Bible Voice Broadcasting	15950as			
1130	1200	s	Germany, Bible Voice Broadcasting	15950as			
1130	1200		Guam, AWR/KSDA	11915as			
1130	1200		UK, BBC World Service	6190af	11940af		
			15485af	17640af	17830af	17885af	
			21470af				
1130	1200		Vatican City, Vatican Radio	15595va	17515va		
1145	1200	vl	Libya, Voice of Africa	17695af	21675af		
			21695af				

1200 UTC - 7AM EST / 6AM CST / 4AM PST

Start	End	Notes	Station				
1200	1215	vl	Cambodia, National Radio	11940as			
1200	1228		France, Radio France Intl	15275af	21620af		
1200	1230		Malaysia, Voice of	15295as			
1200	1230		Uzbekistan, Radio Tashkent	5060as	7190as		
1200	1259		Canada, Radio Canada Intl	7105as	9665as		
1200	1300		Anguilla, Caribbean Beacon	11775am			
1200	1300		Australia, ABC NT Alice Springs	2310do			
			4835irr				
1200	1300		Australia, ABC NT Katherine	2485do			
1200	1300		Australia, ABC NT Tennant Creek	2325do			
1200	1300		Australia, CVC International	13635as			
1200	1300		Australia, Radio	5995pa	6020pa	9475as	
			9560pa	9580pa	9590pa	11880pa	
1200	1300	as	Canada, CBC NQ SW Service	9625na			
1200	1300		Canada, CFRX Toronto ON	6070do			
1200	1300		Canada, CFVP Calgary AB	6030do			
1200	1300		Canada, CKZN St John's NF	6160do			
1200	1300		Canada, CKZU Vancouver BC	6160do			
1200	1300		China, China Radio Intl	9730as	9760pa		
			11760pa	11980as	13685eu	13790eu	
			17490eu				
1200	1300		Costa Rica, University Network	9725va	11870va		
			13750va				
1200	1300		Ecuador, HCJB	12005am	21455am		
1200	1300	DRM/vl	Germany, Deutsche Welle	6140eu			
1200	1300	a	Italy, IRRS	15725va			
1200	1300	vl/as	Italy, IRRS	13840va			
1200	1300	DRM	Luxembourg, Radio	7145eu			
1200	1300		Malaysia, Radio	7295as			
1200	1300		Malaysia, Voice of	6175as			
1200	1300		Netherlands, Radio	9890na			
1200	1300		New Zealand, Radio NZ Intl	15530pa			
1200	1300	DRM	New Zealand, Radio NZ Intl	9460pa			
1200	1300		Nigeria, Voice of	7255af			
1200	1300		Papua New Guinea, Catholic Radio	4960do			
1200	1300		Papua New Guinea, NBC	4890do			
1200	1300	vl	Papua New Guinea, Wantok R.Light	7120va			
1200	1300		Singapore, Radio Singapore Intl	6080as			
			6150as				
1200	1300		South Korea, Radio Korea Intl	9650na			
1200	1300		Taiwan, Radio Taiwan Intl	7130as			
1200	1300		UAE, AWR Africa	15110as			
1200	1300		UK, BBC World Service	6190af	6195as		
			9605ca	9740as	11760me	11855ca	
			11940af	11945as	15190ca	15310as	
			15485af	15575me	17640af	17790as	
			17885af	21470af			
1200	1300		Ukraine, Radio Ukraine Intl	9925eu			

1200	1300		USA, AFRTS	4319usb	5446usb	5765usb
				7590usb	7812usb	12133usb 12579usb
				12133usb	12579usb	13362usb 13855usb
1200	1300		USA, KAIJ Dallas TX	5755na		
1200	1300		USA, KNLS Anchor Point AK	7355as	9615as	
1200	1300		USA, KTBN Salt Lake City UT	7505na		
1200	1300		USA, KWHR Naalehu HI	9930as	12130as	
1200	1300		USA, Voice of America	6110va	9645va	
				9760va	11705va	11715va 15665va
1200	1300		USA, WBCQ Kennebunk ME	9330na	18910na	
1200	1300		USA, WBOH Newport NC	5920am		
1200	1300		USA, WEWN Birmingham AL	5850na	7540na	
				11870na		
1200	1300		USA, WHRA Greenbush ME	11785na	15665na	
1200	1300		USA, WHRI Noblesville IN	6095am	7520am	
				9495am	9840am	
1200	1300		USA, WINB Red Lion PA	9320am		
1200	1300		USA, WRMI Miami FL	9955am		
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WWCR Nashville TN	5070na	5765na	
				5935na	9985na	15825na
1200	1300		USA, WWRB Manchester TN	3185na		
1200	1300		USA, WYFR Okeechobee FL	5950am	5985am	
				17505va		
1200	1300		Zambia, Christian Voice	9865af		
1215	1300		Egypt, Radio Cairo 17835as			
1230	1245	s	Germany, Bible Voice Broadcasting		15950as	
1230	1300		Bangladesh, Bangla Betar	7185as		
1230	1300		Bulgaria, Radio	11700eu	15700eu	
1230	1300		Thailand, Radio	9810va		

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300	1329		Canada, Radio Canada Intl	9665as	9725as	
1300	1330		Ecuador, HCJB	12005am	21455am	
1300	1330		Egypt, Radio Cairo 17835as			
1300	1330		Uzbekistan, Radio Tashkent	5975as	7190as	
1300	1357		Romania, Radio Romania Intl	15105eu	17745eu	
1300	1400		Anguilla, Caribbean Beacon	11775am		
1300	1400		Australia, CVC International	13635as		
1300	1400		Australia, Radio	5995pa	6020pa	9560pa
				9580pa	9590pa	
1300	1400	as	Canada, CBC NQ SW Service	9625na		
1300	1400		Canada, CFRX Toronto ON	6070do		
1300	1400		Canada, CFVP Calgary AB	6030do		
1300	1400		Canada, CKZN St John's NF	6160do		
1300	1400		Canada, CKZU Vancouver BC	6160do		
1300	1400		China, China Radio Intl	9570na	11760pa	
				11885pa	11900pa	11980as 13610eu
				13790eu	15230na	
1300	1400		Costa Rica, University Network	9725va	11870va	
				13750va		
1300	1400		Germany, Deutsche Welle	6140eu		
1300	1400		Germany, Overcomer Ministries		6110eu	
				9855eu		
1300	1400		Jordan, Radio	11690na		
1300	1400	vl	Libya, Voice of Africa	21675af	21695af	
1300	1400	DRM	Luxembourg, Radio	7145eu		
1300	1400		Malaysia, Radio	7295as		
1300	1400		Malaysia, Voice of 6175as			
1300	1400		New Zealand, Radio NZ Intl	9870pa		
1300	1400	DRM	New Zealand, Radio NZ Intl	7230pa		
1300	1400		Nigeria, Voice of 7255af			
1300	1400		North Korea, Voice of	7570eu	9335na	
				11710eu	12015eu	
1300	1400		Papua New Guinea, Catholic Radio		4960do	
1300	1400		Papua New Guinea, NBC	4890do		
1300	1400	vl	Papua New Guinea, Wantok R.Light		7120va	
1300	1400		Poland, Radio Polonia	9525eu	11850eu	
1300	1400		Singapore, Radio Singapore Intl		6080as	
				6150as		
1300	1400		South Korea, Radio Korea Intl	9570na	9770na	
1300	1400		UK, BBC World Service	6190af	6195as	
				9740as	11760me	11940af 11945as
				15190ca	15310as	15420af 15485af
				15575me	17640af	17790as 17830af
				17885af	21470af	
1300	1400		USA, AFRTS	4319usb	5446usb	5765usb
				7590usb	7812usb	12133usb 12579usb
				12133usb	12579usb	13362usb 13855usb
1300	1400		USA, KAIJ Dallas TX	5755na		
1300	1400		USA, KTBN Salt Lake City UT	7505na		
1300	1400		USA, KWHR Naalehu HI	9930as	12130as	
1300	1400		USA, Voice of America	6110va	9645va	
				9760va	11705va	
1300	1400		USA, WBCQ Kennebunk ME	7415na	9330na	
				18910na		
1300	1400		USA, WBOH Newport NC	5920am		
1300	1400		USA, WEWN Birmingham AL	9955na	11645na	
				15745na		
1300	1400		USA, WHRA Greenbush ME	11785na	15665na	
1300	1400		USA, WHRI Noblesville IN	7520am	9840am	
				12020am		
1300	1400	as	USA, WHRI Noblesville IN	9495am		

1300	1400		USA, WINB Red Lion PA	13570am		
1300	1400		USA, WRMI Miami FL	7385am		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WWCR Nashville TN	7465na	9985na	
				13845na	15825na	
1300	1400		USA, WWRB Manchester TN	9320na		
1300	1400		USA, WYFR Okeechobee FL	7580as	11560as	
				11830am	11865am	11910am 11830am
1300	1400		Zambia, Christian Voice	9865af		
1305	1320	am	Austria, Radio Austria Intl	17885va		
1305	1330	s	Austria, Radio Austria Intl	17855va		
1330	1400	s	Australia, HCJB	15405as		
1330	1400	mtwhfa	Guam, AWR/KSDA 15660as			
1330	1400		Guam, TWR/KTWR 9585as			
1330	1400		India, All India Radio	9690as	11620as	
				13710as		
1330	1400		Laos, National Radio	7145as		
1330	1400		Sweden, Radio	7420va	11550va	15240na
1330	1400		Turkey, Voice of	11735va	15155eu	
1345	1400	mtwhf	Austria, Radio Austria Intl	17855va		
1350	1400	vl	Turkmenistan, Turkmen Radio	5015eu		

1400 UTC - 9AM EST / 8AM CST / 6AM PST

1400	1415		Russia, FEBA	7370as		
1400	1429		Czech Rep, Radio Prague Intl	11600as	21745na	
1400	1430	DRM	Canada, Radio Canada Intl	7240eu		
1400	1430	a	Germany, Pan American BC	13820as		
1400	1430		Thailand, Radio	9725va		
1400	1430		Turkey, Voice of	11735oc	15155eu	
1400	1500		Anguilla, Caribbean Beacon	11775am		
1400	1500		Australia, CVC International	13635as		
1400	1500		Australia, HCJB	15390as		
1400	1500		Australia, Radio	5995pa	6020pa	6080as
				7240pa	9590pa	9625as 11750as
1400	1500	as	Canada, CBC NQ SW Service	9625na		
1400	1500		Canada, CFRX Toronto ON	6070do		
1400	1500		Canada, CFVP Calgary AB	6030do		
1400	1500		Canada, CKZN St John's NF	6160do		
1400	1500		Canada, CKZU Vancouver BC	6160do		
1400	1500		Canada, Radio Canada Intl	9515am	13655am	
				17820am		
1400	1500		China, China Radio Intl	9560as	9700eu	
				9795as	11765as	11775as 13610eu
				13675na	13685af	13740na 15230na
				17630af		
1400	1500		Costa Rica, University Network	9725va	11870va	
				13750va		
1400	1500		France, Radio France Intl	7180as	9580as	
				17515as		
1400	1500	as	Germany, Bible Voice Broadcasting		13645as	
1400	1500		Germany, Deutsche Welle	6140eu		
1400	1500		Germany, Overcomer Ministries		6110eu	
				9855eu		
1400	1500		Guam, TWR/KTWR 9975as			
1400	1500		India, All India Radio	9690as	11620as	
				13710as		
1400	1500		Japan, Radio	7200as	9875as	11840oc
1400	1500		Jordan, Radio	11690na		
1400	1500	DRM	Luxembourg, Radio	7145eu		
1400	1500		Malaysia, Radio	7295as		
1400	1500		Malaysia, Voice of 6175as			
1400	1500		Netherlands, Radio	9345as	12080as	
				15595as		
1400	1500		New Zealand, Radio NZ Intl	9870pa		
1400	1500	DRM	New Zealand, Radio NZ Intl	7230pa		
1400	1500		Nigeria, Voice of 7255af			
1400	1500		Oman, Radio Oman	15140as		
1400	1500	vl	Papua New Guinea, Wantok R.Light		7120va	
1400	1500		Singapore, Mediacorp Radio	6150do		
1400	1500	vl	South Africa, Channel Africa	11825af		
1400	1500		Taiwan, Radio Taiwan Intl	15265as		
1400	1500		UK, BBC World Service	5970as	6190af	
				6195as	9740as	11940af 11760me
				12095eu	15310as	15485af 15565eu
				15575me	17640eu	17790as 17830af
				21470af	21660af	
1400	1500	a	UK, BBC World Service	12095af		
1400	1500		USA, AFRTS	4319usb	5446usb	5765usb
				7590usb	7812usb	12133usb 12579usb
				12133usb	12579usb	13362usb 13855usb
1400	1500		USA, KAIJ Dallas TX	13815na		
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	9655as		
1400	1500		USA, KTBN Salt Lake City UT	7505na		
1400	1500		USA, KWHR Naalehu HI	9930as		
1400	1500		USA, Voice of America	6110va	7125va	
				9645va	9760va	11705va 15425va
1400	1500		USA, WBCQ Kennebunk ME	7415na	9330na	
				18910na		
1400	1500		USA, WBOH Newport NC	5920am		
1400	1500		USA, WEWN Birmingham AL	9955na	11645na	
				15745na		
1400	1500		USA, WHRA Greenbush ME	11530na	15665na	

1400	1500	as	USA, WHRI Noblesville IN	9495am	15105am
1400	1500		USA, WHRI Noblesville IN	9840am	11785am
			12020am	13790am	
1400	1500		USA, WINB Red Lion PA	13570am	
1400	1500		USA, WRMI Miami FL	7385am	
1400	1500		USA, WTJC Newport NC	9370am	
1400	1500		USA, WWCR Nashville TN	7465na	9985na
			13845na	15825na	
1400	1500		USA, WWRB Manchester TN	9320na	
1400	1500		USA, WYFR Okeechobee FL	7580as	11560as
			11830am	11910as	13695am	17750am
1400	1500		Zambia, Christian Voice	9865af	
1415	1430		Nepal, Radio	3230as	5005as	6100as
			7165as		
1430	1445	s	Germany, Pan American BC	13800as	
1430	1500		Australia, Radio	9475as	11660as
1430	1500	DRM	South Korea, Radio Korea Intl	9770eu	
1430	1500		Sweden, Radio	11550va	

1500 UTC - 10AM EST / 9AM CST / 7AM PST

1500	1500		France, Radio France Intl	7180as	17515as
1500	1515		Russia, FEBA	7340as	
1500	1515	vl	Turkmenistan, Turkmen Radio	5015eu	
1500	1530		Australia, HCJB	15425as	
1500	1530		Mongolia, Voice of	12015eu	
1500	1530		UK, BBC World Service	6190af	11860af
			11940af	12095af	15400af	15420af
			15485af	17830af	21490af	21660af
1500	1530		USA, Voice of America	7175va	9760va
			9795va	15460va	
1500	1530	DRM	Vatican City, Vatican Radio	7240eu	
1500	1545	as	Germany, Bible Voice Broadcasting		13645as
1500	1557		Canada, Radio Canada Intl	9635as	11975as
1500	1600		Anguilla, Caribbean Beacon	11775am	
1500	1600		Australia, CVC International	13635as	
1500	1600		Australia, Radio	5995as	6080as	7240pa
			9475as	9590pa	9625as	11660as
1500	1600	as	Canada, CBC NQ SW Service	9625na	
1500	1600		Canada, CFRX Toronto ON	6070do	
1500	1600		Canada, CFVP Calgary AB	6030do	
1500	1600		Canada, CKZN St John's NF	6160do	
1500	1600		Canada, CKZU Vancouver BC	6160do	
1500	1600		Canada, Radio Canada Intl	9515am	13655am
			17820 qm		
1500	1600		China, China Radio Intl	6100af	7160as
			9435eu	9525eu	9785as	11775as
			13685na	13740af	17630af	
1500	1600		Costa Rica, University Network	9725va	11870va
			13750va		
1500	1600	a	Germany, Bible Voice Broadcasting		12035as
1500	1600		Germany, Deutsche Welle	6140eu	
1500	1600	a	Germany, Overcomer Ministries		6110eu
			9855eu		
1500	1600	a	Greece, Voice of	9420va	9775va	12105va
			15485va	15630va	
1500	1600		Japan, Radio	6190as	7200as	9505am
			9875as		
1500	1600		Jordan, Radio	11690na	
1500	1600	DRM	Luxembourg, Radio	7145eu	
1500	1600		Malaysia, Radio	7295as	
1500	1600		Malaysia, Voice of	6175as	
1500	1600		Netherlands, Radio	9345as	12080as
1500	1600		New Zealand, Radio NZ Intl	9870pa	
1500	1600	DRM	New Zealand, Radio NZ Intl	7230pa	
1500	1600		North Korea, Voice of	7570eu	9335na
			11710na	12015eu	
1500	1600	vl	Papua New Guinea, Wantok R.Light		7120va
1500	1600		Russia, Voice of	6205as	7260as	7350as
			7415as		
1500	1600	DRM	Russia, Voice of	5810eu	
1500	1600		Singapore, Mediacorp Radio	6150do	
1500	1600	vl	South Africa, Channel Africa	17770af	
1500	1600	DRM/ f	Taiwan, Radio Taiwan Intl	9770eu	
1500	1600		UK, BBC World Service	5970as	5975as
			6195as	9740as	12095eu	15310as
			15565eu	17640eu	17790as	
1500	1600		UK, CVC International	15680af	
1500	1600	vl/ mtwhf	UK, Sudan Radio Service	15575va	
1500	1600		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
1500	1600		USA, KAIJ Dallas TX	13815na	
1500	1600		USA, KJES Vado NM	11715na	
1500	1600		USA, KTBN Salt Lake City UT	7505na	
1500	1600		USA, KWHR Naalehu HI	9930as	
1500	1600		USA, Voice of America	6110va	7125va
			9645va	9685va	11835va	11895va
			13600va	13735va	15255va	17715af
			17895af		
1500	1600		USA, WBCQ Kennebunk ME	7415na	9330na
			18910na		
1500	1600		USA, WBOH Newport NC	5920am	
1500	1600		USA, WEWN Birmingham AL	9955na	11645na

			15745na		
1500	1600		USA, WHRA Greenbush ME	11530na	15665na
1500	1600		USA, WHRI Noblesville IN	9840am	11785am
			13760am	13790am	
1500	1600	as	USA, WHRI Noblesville IN	15105am	
1500	1600		USA, WINB Red Lion PA	13570am	
1500	1600		USA, WRMI Miami FL	7385am	
1500	1600		USA, WTJC Newport NC	9370na	
1500	1600		USA, WWCR Nashville TN	9985na	13845na
			12160na	13845na	15825na	
1500	1600		USA, WWRB Manchester TN	9320na	11915na
1500	1600		USA, WYFR Okeechobee FL	6280as	11830am
			11910am	15520as	15770va	17750am
1500	1600		Zambia, Christian Voice	9865af	
1515	1545		Russia, FEBA	7340as	
1530	1600	mh	Germany, Bible Voice Broadcasting		12035as
1530	1600		Iran, Voice of the Islamic Rep	7330as	9940as
1530	1600	vl	UAE, AWR Africa	9530as	
1530	1600		UK, BBC World Service	6190af	11940af
			12095af	15400af	15485af	17830af
			21470af	21660af	
1530	1600		USA, Voice of America	7175va	9760va
			15460va		
1530	1600		Vatican City, Vatican Radio	9310as	11850as
			13765as		
1545	1600	w	Germany, Bible Voice Broadcasting		12035as
1545	1600	s	Germany, Pan American BC		13820me

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600	1615		Pakistan, Radio	6215as	9385af	11570af
			15725af		
1600	1615		UK, BBC World Service	6190af	11940af
			12095af	15400af	15485af	17820af
			17830af	21660af	
1600	1628	s	Hungary, Radio Budapest	6025eu	9565eu
1600	1629	a	Germany, Universal Life	15640me	
1600	1630	s	Germany, Pan American BC		13820me
1600	1630		Guam, AWR/KSDA	9585as	12065as
1600	1630		Iran, Voice of the Islamic Rep	7330as	9940as
1600	1630		Myanmar, Radio	9730do	
1600	1650		New Zealand, Radio NZ Intl	9870pa	
1600	1650	DRM	New Zealand, Radio NZ Intl	7230pa	
1600	1659		Canada, Radio Canada Intl	9515am	13655am
			17870am		
1600	1700		Anguilla, Caribbean Beacon	11775am	
1600	1700		Australia, CVC International	13635as	
1600	1700		Australia, Radio	5995pa	6080as	7240pa
			9475as	9710pa	11660as	11750as
1600	1700	a	Canada, CBC NQ SW Service	9625na	
1600	1700		Canada, CFRX Toronto ON	6070do	
1600	1700		Canada, CFVP Calgary AB	6030do	
1600	1700		Canada, CKZN St John's NF	6160do	
1600	1700		Canada, CKZU Vancouver BC	6160do	
1600	1700		China, China Radio Intl	6100af	7255eu
			9435eu	9525eu	9570af	11900af
1600	1700		Costa Rica, University Network	11870va	13750va
1600	1700		Ethiopia, Radio	5990af	7110af	7165af
			9560af	9704af	11800af	
1600	1700		France, Radio France Intl	9730va	11615va
			15160va	15365va	15605va	17850va
1600	1700		Germany, Deutsche Welle	6170as	9795as
			11695as		
1600	1700	DRM/vl	Germany, Deutsche Welle	6140eu	
1600	1700	a	Germany, Overcomer Ministries		9855eu
1600	1700		Jordan, Radio	11690na	
1600	1700	DRM	Luxembourg, Radio	7145eu	
1600	1700		Malaysia, Radio	7295as	
1600	1700		Malaysia, Voice of	6175as	
1600	1700		North Korea, Voice of	9990va	11545va
1600	1700	vl	Papua New Guinea, Wantok R.Light		7120va
1600	1700		Russia, Voice of	4965as	4975as	6005va
			6130eu	7260as	7320eu	7415as
			9470me		
1600	1700		South Korea, Radio Korea Intl	5975va	
1600	1700		Taiwan, Radio Taiwan Intl	11815as	
1600	1700		UK, BBC World Service	3915as	5975as
			6195as	7160as	9410as	9740as
			12095eu	15105eu	15310as	15565eu
1600	1700		UK, CVC International	15680af	
1600	1700	vl/ mtwhf	UK, Sudan Radio Service	15575va	
1600	1700		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
1600	1700		USA, KAIJ Dallas TX	13815na	
1600	1700		USA, KJES Vado NM	11715na	
1600	1700		USA, KTBN Salt Lake City UT	15590na	
1600	1700		USA, KWHR Naalehu HI	9930as	
1600	1700		USA, Voice of America	4930va	9685va
			11835va	13600va	15240af	15255va
			15445va	17640va	17895af	
1600	1700	mtwhf	USA, Voice of America	6160va	7125va
			9645va	9760va	
1600	1700		USA, WBCQ Kennebunk ME	7415na	9330na

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
			18910na				
1600	1700		USA, WBOH Newport NC	5920am			
1600	1700		USA, WEWN Birmingham AL	11645va	13615va		
			15745va	15785va			
1600	1700		USA, WHRA Greenbush ME	11530na	17650na		
1600	1700		USA, WHRI Noblesville IN	9840am	13760am		
			15105am				
1600	1700	mtwhf	USA, WINB Red Lion PA	9740am			
1600	1700	as	USA, WINB Red Lion PA	13570as			
1600	1700	mtwhfa	USA, WMLK Bethel PA	9265eu			
1600	1700		USA, WRMI Miami FL	9955am			
1600	1700		USA, WTJC Newport NC	9370na			
1600	1700		USA, WWCR Nashville TN	9985na	12160na		
			13845na	15825na			
1600	1700		USA, WWRB Manchester TN	9320na	11915na		
1600	1700		USA, WYFR Okeechobee FL	6085am	11830am		
			11865am	12010as	13695as	15520as	
			17750va	18980va	21455af	21525af	
1600	1700		Zambia, Christian Voice	9865af			
1605	1620	asm	Austria, Radio Austria Intl	13675na			
1615	1630	twhf	Austria, Radio Austria Intl	13675na			
1615	1700		UK, BBC World Service	6190af	11940af		
			12095af	15400af	15420af	15485af	
			17820af	21660af			
1615	1700	as	UK, BBC World Service	11860af	21490af		
1630	1700		Egypt, Radio Cairo	11785af			
1630	1700	s	Germany, Bible Voice Broadcasting		9460me		
1630	1700		Guam, AWR/KSDA	11980as			
1640	1700	mtwhf	Germany, Bible Voice Broadcasting		9460me		
1645	1700	m	Austria, Radio Austria Intl	13675na			
1645	1700	a	Germany, Bible Voice Broadcasting		9460me		
1651	1700		New Zealand, Radio NZ Intl	11980pa			
1651	1700	DRM	New Zealand, Radio NZ Intl	7230pa			

1700 UTC - 12PM EST / 11AM CST / 9AM PST

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
1700	1710	mtwh	Moldova, Radio PMR	5960eu			
1700	1715	mtwf	Germany, Bible Voice Broadcasting		9460me		
1700	1720	f	Moldova, Radio PMR	5960eu			
1700	1727		Czech Rep, Radio Prague Intl	5930eu	15710af		
1700	1730		France, Radio France Intl	11615va	15605va		
1700	1730		Jordan, Radio	11690na			
1700	1730		Swaziland, TWR	3200af			
1700	1745	h	Germany, Bible Voice Broadcasting		9460me		
1700	1750		New Zealand, Radio NZ Intl	11980pa			
1700	1750	DRM	New Zealand, Radio NZ Intl	7230pa			
1700	1800		Anguilla, Caribbean Beacon	11775am			
1700	1800		Australia, CVC International	13635as			
1700	1800		Australia, Radio	5995pa	6080as	7240pa	
			9475as	9580pa	9710pa	11880pa	
1700	1800	a	Canada, CBC NQ SW Service	9625na			
1700	1800		Canada, CFRX Toronto ON	6070do			
1700	1800		Canada, CFVP Calgary AB	6030do			
1700	1800		Canada, CKZN St John's NF	6160do			
1700	1800		Canada, CKZU Vancouver BC	6160do			
1700	1800		China, China Radio Intl	6100eu	7255eu		
			9570af	11900af			
1700	1800		Costa Rica, University Network	11870va	13750va		
1700	1800		Egypt, Radio Cairo	11785af			
1700	1800		Eqt Guinea, Radio Africa	15190af			
1700	1800	as	Germany, Bible Voice Broadcasting		9460me		
1700	1800	DRM/vl	Germany, Deutsche Welle	6140eu			
1700	1800	DRM/vl	Germany, Deutsche Welle	6140eu			
1700	1800		Japan, Radio	9535am	11970eu	15355va	
1700	1800	DRM	Luxembourg, Radio	7145eu			
1700	1800		Malaysia, Radio	7295as			
1700	1800		Malaysia, Voice of	6175as			
1700	1800		Nigeria, Voice of	7255va			
1700	1800	vl	Papua New Guinea, Wantok R.Light		7120va		
1700	1800		Russia, Voice of	5910as	7320eu	7360va	
			7415as	9470me			
1700	1800		South Africa, Channel Africa	15285af			
1700	1800		Taiwan, Radio Taiwan Intl	11850af			
1700	1800		UK, BBC World Service	3915as	5975as		
			6195eu	7160as	9410eu	9740as	
			12095eu	15105eu	15310as		
1700	1800		UK, CVC International	15680af			
1700	1800	vl/ mtwhf	UK, Sudan Radio Service	11705va			
1700	1800		USA, AFRTS	4319usb	5446usb	5765usb	
			7590usb	7812usb	12133usb	12579usb	
			12133usb	12579usb	13362usb	13855usb	
1700	1800		USA, KAIJ Dallas TX	13815na			
1700	1800		USA, KTBN Salt Lake City UT	15590na			
1700	1800		USA, KWHR Naalehu HI	9930as			
1700	1800		USA, Voice of America	13710af	15240af		
			15445af				
1700	1800		USA, WBCQ Kennebunk ME	7415na	9330na		
			18910na				
1700	1800		USA, WBOH Newport NC	5920am			
1700	1800		USA, WEWN Birmingham AL	11645va	13615va		
			15745va	15785va			
1700	1800		USA, WHRA Greenbush ME	11530na	17650na		
1700	1800		USA, WHRI Noblesville IN	9840am	11885am		
			13760am	15105am			

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
1700	1800	mtwhf	USA, WINB Red Lion PA	9740am			
1700	1800	as	USA, WINB Red Lion PA	13570am			
1700	1800	mtwhfa	USA, WMLK Bethel PA	9265eu	15265eu		
1700	1800	mtwhfa	USA, WMLK Bethel PA	9265eu	15265eu		
1700	1800		USA, WRMI Miami FL	9955am			
1700	1800		USA, WTJC Newport NC	9370na			
1700	1800		USA, WWCR Nashville TN	9985na	12160na		
			13845na	15825na			
1700	1800		USA, WWRB Manchester TN	9320na	11915na		
			15250na				
1700	1800		USA, WYFR Okeechobee FL	3955af	13695am		
			17795va	18980va	21455af	21680af	
1700	1800		Zambia, Christian Voice	4965af			
1715	1730		Vatican City, Vatican Radio	4005va	5885va		
			7250va	9645va	9755va		
1730	1745	vl	Libya, Voice of Africa	11860af			
1730	1745	f	Russia, FEBA	7345as			
1730	1745	mtwhf	UK, United Nations Radio	7170af	9565me		
			17810af				
1730	1800		Guam, AWR/KSDA	9980me			
1730	1800		Liberia, ELWA	4760do			
1730	1800		Philippines, Radio Pilipinas	11720va	15190va		
			17720va				
1730	1800		Slovakia, Radio Slovakia Intl	5915eu	6055eu		
1730	1800		Swaziland, TWR	3200af	9500af		
1730	1800	mtwhf	USA, Voice of America	9830af	12080af		
			17785af				
1730	1800		Vatican City, Vatican Radio	9755af	11625af		
			13765af				
1745	1800		Bangladesh, Bangla Betar	7185eu			
1745	1800	t	Germany, Bible Voice Broadcasting		9460me		
1745	1800		India, All India Radio	7410eu	9445eu		
			9950eu	11620eu	11935af	13605af	
			15075af	15155as	17670af		
1745	1800	vl	Libya, Voice of Africa	15220af	15615af		
			15660af	17695af			
1745	1800		UK, BBC World Service	3255af	6190af		
			6195af	12095af	15400af	15420af	
			17820af	17830af	21470af		
1751	1800		New Zealand, Radio NZ Intl	15720pa			
1751	1800	DRM	New Zealand, Radio NZ Intl	11610pa			

1800 UTC - 1PM EST / 12PM CST / 10AM PST

Start	End	Days	Station	Freq1	Freq2	Freq3	Freq4
1800	1810		Zanzibar, Radio Tanzania	11735af			
1800	1815	a	Germany, Bible Voice Broadcasting		7210me		
1800	1827		Czech Rep, Radio Prague Intl	5930eu	9400va		
1800	1829	s	Germany, Universal Life	15675eu			
1800	1830	w f	Austria, AWR Europe	9815af			
1800	1830		Egypt, Radio Cairo	11785af			
1800	1830	a	Germany, Bible Voice Broadcasting		9460me		
1800	1830		South Africa, AWR Africa	3215af	3345af		
			11925af				
1800	1830		Swaziland, TWR	3200af	9500af		
1800	1830		UK, BBC World Service	3255af	5975as		
			6190af	6195af	9740as	12095af	
			13700af				
1800	1830		Vietnam, Voice of	5955eu			
1800	1850	DRM	New Zealand, Radio NZ Intl	11610pa			
1800	1857		Romania, Radio Romania Intl	7120eu	9640eu		
1800	1859		Canada, Radio Canada Intl	7185af	9770af		
			11875af	17740af			
1800	1900		Anguilla, Caribbean Beacon	11775am			
1800	1900	mtwhf	Argentina, RAE	9690eu	15345eu		
1800	1900		Australia, Radio	6080pa	7240pa	9475as	
			9580pa	9710pa	11880pa		
1800	1900		Canada, CFRX Toronto ON	6070do			
1800	1900		Canada, CFVP Calgary AB	6030do			
1800	1900		Canada, CKZN St John's NF	6160do			
1800	1900		Canada, CKZU Vancouver BC	6160do			
1800	1900		China, China Radio Intl	6100eu			
1800	1900		Costa Rica, University Network	11870va	13750va		
1800	1900		Eqt Guinea, Radio Africa	15190af			
1800	1900	fsw	Germany, Bible Voice Broadcasting		9460me		
1800	1900	as	Germany, Bible Voice Broadcasting		9730me		
1800	1900	DRM/vl	Germany, Deutsche Welle	6140eu			
1800	1900		India, All India Radio	7410eu	9445eu		
			9950eu	11620eu	11935af	13605af	
			15075af	15155as	17670af		
1800	1900		Liberia, ELWA	4760do			
1800	1900		Malaysia, Radio	7295as			
1800	1900		Malaysia, Voice of	6175as			
1800	1900		Netherlands, Radio	6020af	9895af		
			11655af				
1800	1900		New Zealand, Radio NZ Intl	15720pa			
1800	1900		Nigeria, Voice of	7255va			
1800	1900		North Korea, Voice of	7570eu	12015eu		
1800	1900	vl	Papua New Guinea, Wantok R.Light		7120va		
1800	1900		Philippines, Radio Pilipinas	11720va	15190va		
			17720va				
1800	1900		Poland, Radio Polonia	7220eu	7265eu		
1800	1900		Russia, Voice of	5910as	7360va	7415as	
			11519eu				
1800	1900		Taiwan, Radio Taiwan Intl	3965eu			

Start	End	Notes	Station	Freq 1	Freq 2	Freq 3	Freq 4
1800	1900		UK, BBC World Service	6195eu	9410eu		
				12095eu			
1800	1900		UK, CVC International	9765af			
1800	1900		USA, AFRTS	4319usb	5446usb	5765usb	
				7590usb	7812usb	12133usb	12579usb
				12133usb	12579usb	13362usb	13855usb
1800	1900		USA, KAIJ Dallas TX	13815na			
1800	1900		USA, KTBN Salt Lake City UT	15590na			
1800	1900		USA, KWHR Naalehu HI	9930as			
1800	1900		USA, Voice of America	4930af	6035af		
				11975af	13710af	15240af	17895af
1800	1900		USA, WBCQ Kennebunk ME	7415na	9330na		
				18910na			
1800	1900		USA, WBOH Newport NC	5920am			
1800	1900		USA, WEWN Birmingham AL	11645va	13615va		
				15745va	15785va		
1800	1900		USA, WHRA Greenbush ME	11530na	17650na		
1800	1900		USA, WHRI Noblesville IN	9840am	11885am		
				15105am			
1800	1900	mtwhf	USA, WINB Red Lion PA	9740am			
1800	1900	as	USA, WINB Red Lion PA	13570am			
1800	1900	mtwhfa	USA, WMLK Bethel PA	9265eu	15265eu		
1800	1900		USA, WRMI Miami FL	9955am			
1800	1900		USA, WTJC Newport NC	9370na			
1800	1900		USA, WWCR Nashville TN	9985na	12160na		
				13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9320na	11915na		
				15250na			
1800	1900		USA, WYFR Okeechobee FL	3955va	7240me		
				7425am	13695am	13800am	17525am
				17795va		18980va	
1800	1900		Yemen, Rep of Yemen Radio	9780me			
1800	1900		Zambia, Christian Voice	4965af			
1815	1830	vl	Libya, Voice of Africa	9485af	11615af		
				11635af	11715af	11860af	
1815	1900		Bangladesh, Bangla Betar	7185as			
1830	1845		Israel, Kol Israel	7545va	9345va	11590va	
1830	1900		Bulgaria, Radio	5800eu	7500eu		
1830	1900		Swaziland, TWR	3200af			
1830	1900		Sweden, Radio	6065va			
1830	1900		UK, BBC World Service	3255af	5975me		
				6005af	6190af	9410af	9630af
				9740me	11945af	12095af	13700af
				15400af	15470af		
1845	1900		Congo, RTV Congolaise	4765af	5985af		
1851	1900	DRM	New Zealand, Radio NZ Intl	13595pa			

1900 UTC - 2PM EST / 1PM CST / 11AM PST

Start	End	Notes	Station	Freq 1	Freq 2	Freq 3	Freq 4
1900	1915		Congo, RTV Congolaise	4765af	5985af		
1900	1929	s	Germany, Universal Life	7105me			
1900	1930	s	Germany, Bible Voice Broadcasting		6015eu		
1900	1930		Lithuania, Radio Vilnius	9710eu			
1900	1930		Philippines, Radio Pilipinas	11720va	15190va		
				17720va			
1900	1930`	a	Germany, Bible Voice Broadcasting		7260af		
				9460me			
1900	1945		India, All India Radio	7410eu	9445eu		
				9950eu	11620eu	11935af	13605af
				15075af	15155as	17670af	
1900	2000		Anguilla, Caribbean Beacon	11775am			
1900	2000		Australia, Radio	6080pa	7240pa	9500as	
				9580pa	9710pa	11880pa	
1900	2000		Canada, CFRX Toronto ON	6070do			
1900	2000		Canada, CFVP Calgary AB	6030do			
1900	2000		Canada, CKZN St John's NF	6160do			
1900	2000		Canada, CKZU Vancouver BC	6160do			
1900	2000		China, China Radio Intl	7295va	9440af		
1900	2000		Costa Rica, University Network	11870va	13750va		
1900	2000		Eqt Guinea, Radio Africa	15190af			
1900	2000	as	Germany, Bible Voice Broadcasting		6015eu		
				9460me			
1900	2000		Germany, Deutsche Welle	12025af	15470af		
1900	2000		Germany, Overcomer Ministries	9495af			
1900	2000	vl	Ghana, Ghana BC Corp	3366do	4915do		
1900	2000		Liberia, ELWA	4760do			
1900	2000		Malaysia, Radio	7295as			
1900	2000	vl	Namibia, Namibian BC Corp	3270do	3290do		
				6060do	6175do		
1900	2000		Netherlands, Radio	7120af	9895af		
				11655af			
1900	2000	as	Netherlands, Radio	15315na	15525na		
				17735na			
1900	2000		New Zealand, Radio NZ Intl	15720pa			
1900	2000	DRM	New Zealand, Radio NZ Intl	13595pa			
1900	2000		Nigeria, Radio/Ibadan	6050do			
1900	2000		Nigeria, Radio/Kaduna	4770do	6090do		
1900	2000		Nigeria, Radio/Lagos	3326do	4990do		
1900	2000		Nigeria, Voice of	7255va			
1900	2000		North Korea, Voice of	7100af	9975va		
				11535va	11910af		
1900	2000		Papua New Guinea, Catholic Radio	4960do			
1900	2000		Papua New Guinea, NBC	4890do			
1900	2000	vl	Papua New Guinea, Wantok R.Light	7120va			

Start	End	Notes	Station	Freq 1	Freq 2	Freq 3	Freq 4
1900	2000		Russia, Voice of	6175eu	7335af	7360eu	
				11510af			
1900	2000	irreg/ vl	Sierra Leone, SLBS	3316do			
1900	2000	vl	Solomon Islands, SIBC	5020do	9545do		
1900	2000	vl	South Africa, Channel Africa	3345af			
1900	2000	m	South Africa, Radio League	3215af			
1900	2000		South Korea, Radio Korea Intl	5975va	7275eu		
1900	2000	a	Sri Lanka, SLBC	6010eu			
1900	2000		Swaziland, TWR	3200af			
1900	2000	DRM	Sweden, Radio	11805eu			
1900	2000		Thailand, Radio	9805eu			
1900	2000	vl	Uganda, Radio	4976do	5026do	7196do	
1900	2000		UK, BBC World Service	3255af		5975me	
				6005af	6190af	6195va	9410af
				9630af	9740me	12095af	13700af
				15400af	15420af	17830af	21470af
1900	2000		UK, CVC International	9765af			
1900	2000		USA, AFRTS	4319usb	5446usb	5765usb	
				7590usb	7812usb	12133usb	12579usb
				12133usb	12579usb	13362usb	13855usb
1900	2000		USA, KAIJ Dallas TX	13815na			
1900	2000		USA, KJES Vado NM	15385na			
1900	2000		USA, KTBN Salt Lake City UT	15590na			
1900	2000		USA, Voice of America	4930af		4940af	
				6035af	9785va	11975af	12015va
				13640va	13710af	15240af	15580af
				17805af			
1900	2000		USA, WBCQ Kennebunk ME	7415na	9330na		
				18910na			
1900	2000		USA, WBOH Newport NC	5920am			
1900	2000		USA, WEWN Birmingham AL	11645va	13615va		
				15745va	15785va		
1900	2000		USA, WHRA Greenbush ME	11530na	15665na		
1900	2000		USA, WHRI Noblesville IN	9840am	11885am		
				15285am	15665am		
1900	2000	mtwhf	USA, WINB Red Lion PA	9740am			
1900	2000	as	USA, WINB Red Lion PA	13570am			
1900	2000	mtwhfa	USA, WMLK Bethel PA	9265eu	15265eu		
1900	2000		USA, WRMI Miami FL	9955am			
1900	2000		USA, WTJC Newport NC	9370na			
1900	2000		USA, WWCR Nashville TN	9975na	9985na		
				12160na	13845na	15825na	
1900	2000		USA, WWRB Manchester TN	9320na	11915na		
				15250na			
1900	2000		USA, WYFR Okeechobee FL	3230af	6020af		
				6085va	17845af	18930va	18980va
1900	2000		Zambia, Christian Voice	4965af			
1900	2000	vl	Zimbabwe, ZBC Corp	5975do			
1915	1930	vl	Libya, Voice of Africa	11635af	11715af		
1915	2000	f	Germany, Bible Voice Broadcasting		9460me		
1925	1945		Armenia, Voice of	4810eu	9965as		
1930	1945	vl	Libya, Voice of Africa	11715af			
1930	2000	s	Germany, Bible Voice Broadcasting		7260af		
1930	2000	a	Germany, Pan American BC	7260af			
1930	2000		Greece, Voice of	7430eu			
1930	2000		Iran, Voice of the Islamic Rep	6010eu	7320eu		
				7350af	9855af	9925af	11695af
1930	2000		Serbia & Montenegro, Intl Radio		6100eu		
1930	2000		Slovakia, Radio Slovakia Intl	5915eu	7345eu		
1930	2000		Turkey, Voice of	6055eu			
1935	1955		Italy, RAI Intl	6035eu	9760eu		
1945	2000	mtwhfa	Albania, Radio Tirana	6225eu	7530eu		
1945	2000	vl	Rwanda, Radio	6055do			

2000 UTC - 3PM EST / 2PM CST / 12PM PST

Start	End	Notes	Station	Freq 1	Freq 2	Freq 3
2000	2015	s	Germany, Bible Voice Broadcasting		9460me	
2000	2015	s	Germany, Pan American BC	7260af		
2000	2025		Israel, Kol Israel	6280af	7545va	11590va
				15640af		
2000	2028		Hungary, Radio Budapest	3975eu	6025eu	
2000	2030	s	Germany, Bible Voice Broadcasting		6015eu	
2000	2030		Iran, Voice of the Islamic Rep	6010eu	7320eu	
				7350af	9855af	9925af	11695af
2000	2030		Mongolia, Voice of	12015eu		
2000	2030		South Africa, AWR Africa	9655af		
2000	2030		Swaziland, TWR	3200af		
2000	2030		Turkey, Voice of	6055eu		
2000	2030		USA, Voice of America	4930af	4940af	
				6035af	11975af	13710af	15240af
				15580af		
2000	2030	as	USA, Voice of America	4940af		
2000	2030		Vatican City, Vatican Radio	7365af	9755af	
				11625af		
2000	2100		Anguilla, Caribbean Beacon	11775am		
2000	2100		Australia, ABC NT Alice Springs		2310do	
				4835irr		
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek		2325do	
2000	2100		Australia, Radio	9500as	11650pa	11660pa
				11880pa	12080pa	
2000	2100	as	Australia, Radio	6080pa	7240pa	
2000	2100		Canada, CFRX Toronto ON	6070do		
2000	2100		Canada, CFVP Calgary AB	6030do		

Start	Stop	Days	Station	Frequencies
2000	2100		Canada, CKZN St John's NF	6160do
2000	2100		Canada, CKZU Vancouver BC	6160do
2000	2100		China, China Radio Intl	5960eu 7190eu 7285eu 7295va 9440va 9490eu 9600eu 11640af 13630af
2000	2100		Costa Rica, University Network	13750va
2000	2100		Eqt Guinea, Radio Africa	15190af
2000	2100		Germany, Deutsche Welle	9735af 9830af 12025af 15410af
2000	2100	vl	Ghana, Ghana BC Corp	3366do 4915do
2000	2100		Indonesia, Voice of	9525as 11785pa 15150al
2000	2100	vl/fs	Italy, IRRS	5775va
2000	2100	vl/mtwha	Italy, IRRS	5775va
2000	2100		Liberia, ELWA	4760do
2000	2100		Malaysia, Radio	7295as
2000	2100	vl	Namibia, Namibian BC Corp	3270do 3290do 6060do 6175do
2000	2100		Netherlands, Radio	7120af 9895af 11655af 17810af
2000	2100	as	Netherlands, Radio	15315na 15525na 17725na
2000	2100		New Zealand, Radio NZ Intl	15720pa
2000	2100	DRM	New Zealand, Radio NZ Intl	13595pa
2000	2100		Nigeria, Radio/Ibadan	6050do
2000	2100		Nigeria, Radio/Kaduna	4770do 6090do
2000	2100		Nigeria, Radio/Lagos	3326do 4990do
2000	2100		Nigeria, Voice of	7255va
2000	2100		Papua New Guinea, Catholic Radio	4960do
2000	2100		Papua New Guinea, NBC	4890do
2000	2100	vl	Papua New Guinea, Wantok R.Light	7120va
2000	2100		Russia, Voice of	6145eu 7290eu 7330eu 15735ca
2000	2100	vl	Solomon Islands, SIBC	5020do 9545do
2000	2100	vl	South Africa, Channel Africa	3345af
2000	2100	vl	South Korea, Radio Korea Intl	3955eu
2000	2100	mtwhf	Spain, Radio Exterior Espana	9595af 9680eu
2000	2100	vl	Uganda, Radio	4976do 5026do 7196do
2000	2100		UK, BBC World Service	3255af 6005af 6190va 6195va 9410va 9630va 12095af 15400af 17830af
2000	2100		UK, CVC International	7285af
2000	2100		USA, AFRTS	4319usb 5446usb 5765usb 7590usb 7812usb 12133usb 12579usb 12133usb 12579usb 13362usb 13855usb
2000	2100		USA, KAIJ Dallas TX	13815na
2000	2100		USA, KJES Vado NM	15385na
2000	2100		USA, KTBN Salt Lake City UT	15590na
2000	2100		USA, WBCQ Kennebunk ME	7415na 9330na 18910na
2000	2100		USA, WBOH Newport NC	5920am
2000	2100		USA, WEWN Birmingham AL	11645va 13615va 15745va 15785va
2000	2100		USA, WHRA Greenbush ME	11530na 15665na
2000	2100		USA, WHRI Noblesville IN	9840am 11885am 15285am 15665am
2000	2100	mtwhf	USA, WINB Red Lion PA	9740am
2000	2100	as	USA, WINB Red Lion PA	13570am
2000	2100	mtwhfa	USA, WMLK Bethel PA	9265eu 15265eu
2000	2100		USA, WRMI Miami FL	9955am
2000	2100		USA, WTJC Newport NC	9370na
2000	2100		USA, WWCR Nashville TN	9975na 9985na 12160na 13845na 15825na
2000	2100		USA, WWRB Manchester TN	9320na 11915na 15250na
2000	2100		USA, WYFR Okeechobee FL	3230af 6020af 7360va 13800am 15195af 17725va 17750va 17795am 17845af 18980va
2000	2100		Zambia, Christian Voice	4965af
2000	2100	vl	Zimbabwe, ZBC Corp	5975do
2000	2130		China, China Radio Intl	11640af 13630af
2005	2100		Syria, Radio Damascus	9330eu 12085eu 13610al
2020	2045	vl/ m	Vatican City, Vatican Radio	6185eu
2025	2045		Italy, RAI Intl	6020af
2030	2045	vl	Libya, Voice of Africa	11635af
2030	2045		Thailand, Radio	9535eu
2030	2100	thf	Belarus, Radio	7125eu 7340eu 7440eu
2030	2100		Cuba, Radio Havana	9505va 11760va
2030	2100		Egypt, Radio Cairo	15375af
2030	2100		Sweden, Radio	6065va 7420va
2030	2100		USA, Voice of America	4930af 6035af 7595as 11975af 13710af 15240af 15580af
2030	2100		Uzbekistan, Radio Tashkent	7185as
2045	2100		India, All India Radio	7410eu 9445eu 9910oc 9950eu 11620va 11715oc
2045	2100	DRM	Vatican City, Vatican Radio	9800na
2050	2100		Vatican City, Vatican Radio	4005eu 5885eu 7250eu

2100 UTC - 4PM EST / 3PM CST / 1PM PST

Start	Stop	Days	Station	Frequencies
2100	2120		Vatican City, Vatican Radio	4005eu 5885eu 7250eu
2100	2127		Czech Rep, Radio Prague Intl	5930va 9430va
2100	2130		Australia, ABC NT Katherine	2485do
2100	2130		Australia, ABC NT Tennant Creek	2325do
2100	2130		Australia, Radio	9500as 11695as
2100	2130	a	Canada, CBC NQ SW Service	9625na
2100	2130		Cuba, Radio Havana	9505va 11760va
2100	2130	vl/mtwha	Italy, IRRS	5775va
2100	2130	vl	South Korea, Radio Korea Intl	3955eu
2100	2130	mtwhf	UK, BBC World Service	15390ca
2100	2130		USA, Voice of America	7575va
2100	2130	DRM	Vatican City, Vatican Radio	9800na
2100	2145		Nigeria, Radio/Ibadan	6050do
2100	2159		Canada, Radio Canada Intl	5850eu 9770eu 15180am
2100	2200		Anguilla, Caribbean Beacon	11775am
2100	2200		Australia, ABC NT Alice Springs	2310do 4835irr
2100	2200		Australia, Radio	9660pa 7240pa 11650pa 11660pa 12080pa 13630pa 15515pa
2100	2200		Austria, AWR Europe	9830af
2100	2200		Canada, CFRX Toronto ON	6070do
2100	2200		Canada, CFVP Calgary AB	6030do
2100	2200		Canada, CKZN St John's NF	6160do
2100	2200		Canada, CKZU Vancouver BC	6160do
2100	2200		China, China Radio Intl	5960eu 7285eu 9490eu 9600eu
2100	2200		Costa Rica, University Network	13750va
2100	2200		Egypt, Radio Cairo	15375af
2100	2200		Eqt Guinea, Radio Africa	15190af
2100	2200		Germany, Deutsche Welle	9615af 11690af
2100	2200	vl	Ghana, Ghana BC Corp	3366do 4915do
2100	2200		Guyana, Voice of	3291do 5950do
2100	2200		India, All India Radio	7410eu 9445eu 9910oc 9950eu 11620va 11715oc
2100	2200	vl/fs	Italy, IRRS	5775va
2100	2200		Japan, Radio	6035oc 6090eu 6180eu 11855va 17825va 21670pa
2100	2200		Liberia, ELWA	4760do
2100	2200		Liberia, Star Radio	11960af
2100	2200		Malaysia, Radio	7295as
2100	2200	vl	Namibia, Namibian BC Corp	3270do 3290do 6060do 6175do
2100	2200		New Zealand, Radio NZ Intl	15720pa
2100	2200	DRM	New Zealand, Radio NZ Intl	13595pa
2100	2200		Nigeria, Radio/Kaduna	4770do 6090do
2100	2200		Nigeria, Radio/Lagos	3326do 4990do
2100	2200		North Korea, Voice of	7570eu 12015eu
2100	2200		Papua New Guinea, Catholic Radio	4960do
2100	2200		Papua New Guinea, NBC	4890do
2100	2200	vl	Papua New Guinea, Wantok R.Light	7120va
2100	2200		Russia, Voice of	7330eu 15735ca
2100	2200	vl	Rwanda, Radio	6055do
2100	2200	irreg/ vl	Sierra Leone, SLBS	3316do
2100	2200	vl	South Africa, Channel Africa	3345af
2100	2200	vl	Syria, Radio Damascus	9330eu 12085eu 13610al
2100	2200		UK, BBC World Service	3255af 3915as 5965as 6005af 6110as 6190af 6195eu 9410eu 9605af 11675ca 15400af
2100	2200		USA, AFRTS	4319usb 5446usb 5765usb 7590usb 7812usb 12133usb 12579usb 12133usb 12579usb 13362usb 13855usb
2100	2200		USA, KAIJ Dallas TX	13815na
2100	2200		USA, KTBN Salt Lake City UT	15590na
2100	2200		USA, Voice of America	4930af 6035af 11975af 13710af 15240af 15580af
2100	2200		USA, WBCQ Kennebunk ME	7415na 9330na 18910na
2100	2200		USA, WBOH Newport NC	5920am
2100	2200		USA, WEWN Birmingham AL	11645va 13615va 15745va 15785va
2100	2200		USA, WHRA Greenbush ME	11530na 15665na
2100	2200		USA, WHRI Noblesville IN	7315am 9840am 11885am 15665am
2100	2200		USA, WINB Red Lion PA	13570am
2100	2200		USA, WMLK Bethel PA	15265eu
2100	2200		USA, WRMI Miami FL	7385am
2100	2200		USA, WTJC Newport NC	9370na
2100	2200		USA, WWCR Nashville TN	9975na 9985na 12160na 13845na 15825na
2100	2200		USA, WWRB Manchester TN	9320na 11915na 15250na
2100	2200		USA, WYFR Okeechobee FL	7260va 11565va 11655af 13800am 15195af 17725af 17795va 17845va 18980va
2100	2200		Zambia, Christian Voice	4965af
2100	2200	vl	Zimbabwe, ZBC Corp	5975do
2115	2130	vl	Libya, Voice of Africa	11635af
2115	2200		Egypt, Radio Cairo	9990eu
2115	2200		USA, WYFR Okeechobee FL	11875af
2130	2157		Romania, Radio Romania Intl	7145eu 9650eu 9755na 11940na
2130	2200		Australia, ABC NT Katherine	5025do
2130	2200		Australia, ABC NT Tennant Creek	4910do
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na

2130	2200		Guam, AWR/KSDA	11960as	
2130	2200	DRM	Netherlands, Radio	9800na	
2130	2200		Turkey, Voice of	9525va	
2130	2200	t f	UK, BBC World Service	11680ca	
2130	2200		USA, Voice of America	6235as	
2130	2200		Uzbekistan, Radio Tashkent	7185as	

2200 UTC - 5PM EST / 4PM CST / 2PM PST

2200	2210		Syria, Radio Damascus	9330eu	12085eu
2200	2228		Hungary, Radio Budapest	6025eu	9735eu
2200	2229		Canada, Radio Canada Intl	11990sa	
2200	2230	s	Belarus, Radio	7125eu	7340eu	7440eu
2200	2230		India, All India Radio	7410eu	9445eu
			9910oc	9950eu	11620va	11715oc
2200	2230		Papua New Guinea, NBC	9675do	
2200	2230		Turkey, Voice of	9525va	
2200	2235		New Zealand, Radio NZ Intl	15720pa	
2200	2235	DRM	New Zealand, Radio NZ Intl	13595pa	
2200	2245		Egypt, Radio Cairo	9990eu	
2200	2257		Czech Rep, Radio Prague Intl	5930na	7345af
2200	2300		Anguilla, Caribbean Beacon	6090am	
2200	2300		Australia, ABC NT Alice Springs		2310do
			4835irr		
2200	2300		Australia, ABC NT Katherine	5025do	
2200	2300		Australia, ABC NT Tennant Creek		4910do
2200	2300		Australia, Radio	12010va	13620as	13630pa
			15230pa	15240as	15515pa	17785pa
			17795pa		
2200	2300		Bulgaria, Radio	5800eu	7500eu
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na	
2200	2300		Canada, CFRX Toronto ON	6070do	
2200	2300		Canada, CFVP Calgary AB	6030do	
2200	2300		Canada, CKZN St John's NF	6160do	
2200	2300		Canada, CKZU Vancouver BC	6160do	
2200	2300	DRM	Canada, Radio Canada Intl	9800do	
2200	2300		China, China Radio Intl	7170eu	
2200	2300		Costa Rica, University Network	13750va	
2200	2300		Eqt Guinea, Radio Africa	15190af	
2200	2300		Germany, Deutsche Welle	6000as	6225as
2200	2300	vl	Ghana, Ghana BC Corp	3366do	4915do
2200	2300		Guyana, Voice of	3291do	
2200	2300	vl/fs	Italy, IRRS	5775va	
2200	2300		Malaysia, Radio	7295as	
2200	2300	vl	Namibia, Namibian BC Corp	3270do	3290do
			6060do	6175do	
2200	2300		Nigeria, Radio/Ibadan	6050do	
2200	2300		Nigeria, Radio/Kaduna	4770do	6090do
2200	2300		Nigeria, Radio/Lagos	3326do	4990do
2200	2300		Papua New Guinea, Catholic Radio	4960do	
2200	2300	vl	Papua New Guinea, Wantok R.Light		7120va
2200	2300	irreg/ vl	Sierra Leone, SLBS	3316do	
2200	2300	vl	Solomon Islands, SIBC	5020do	9545do
2200	2300	as	Spain, Radio Exterior Espana	6125va	9595af
2200	2300		Taiwan, Radio Taiwan Intl	9355eu	
2200	2300		UK, BBC World Service	5955as	5965as
			5975as	5990as	6195as	9605af
			9740as	15400af	
2200	2300		Ukraine, Radio Ukraine Intl	5840eu	
2200	2300		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
2200	2300		USA, KAIJ Dallas TX	13815na	
2200	2300		USA, KTBN Salt Lake City UT	15590na	
2200	2300		USA, Voice of America	6235as	7120va
			9890va	15185va	15290va	15305va
			17740va		
2200	2300		USA, WBCQ Kennebunk ME	5110na	7415na
			9330na	18910na	
2200	2300		USA, WBOH Newport NC	5920am	
2200	2300		USA, WEWN Birmingham AL	7560va	9975va
			11645va	15745va	
2200	2300		USA, WHRA Greenbush ME	5850na	6195na
			15665na		
2200	2300		USA, WHRI Noblesville IN	7315am	7490am
			11885am	15665am	
2200	2300		USA, WINB Red Lion PA	13570am	
2200	2300		USA, WRMI Miami FL	7385am	
2200	2300		USA, WRMI Miami FL	7385am	
2200	2300		USA, WTJC Newport NC	9370na	
2200	2300		USA, WWCR Nashville TN	7465na	9985na
			12160na	13845na	
2200	2300		USA, WWRB Manchester TN	9320na	11915na
			15250na		
2200	2300		USA, WYFR Okeechobee FL	11740am	11875af
			15770af		
2200	2300		Zambia, Christian Voice	4965af	
2205	2230		Italy, RAI Intl	6090as	
2230	2259		Canada, Radio Canada Intl	6160as	7195as
			9730as		
2230	2300	mtwhfa	Albania, Radio Tirana	7110eu	
2230	2300	as	Australia, HCJB	15530as	
2230	2300		Guam, AWR/KSDA	11655as	
2230	2300		Sweden, Radio	6065va	

2230	2300		USA, Voice of America	7230va	9780va
			13755va		
2236	2300		New Zealand, Radio NZ Intl	17675pa	
2236	2300	DRM	New Zealand, Radio NZ Intl	15720pa	
2245	2300		India, All India Radio	9705as	9950as
			11620as	11645as	13605as

2300 UTC - 6PM EST / 5PM CST / 3PM PST

2300	0000		Anguilla, Caribbean Beacon	6090am	
2300	0000		Australia, ABC NT Alice Springs		2310do
			4835irr		
2300	0000		Australia, ABC NT Katherine	5025do	
2300	0000		Australia, ABC NT Tennant Creek		4910do
2300	0000		Australia, Radio	9660pa	12010va	12080pa
			13620as	13630pa	13670na	15230pa
			17785pa	17795pa	21740pa
2300	0000	smtwhf	Canada, CBC NQ SW Service	9625na	
2300	0000		Canada, CFRX Toronto ON	6070do	
2300	0000		Canada, CFVP Calgary AB	6030do	
2300	0000		Canada, CKZN St John's NF	6160do	
2300	0000		Canada, CKZU Vancouver BC	6160do	
2300	0000		China, China Radio Intl	5915as	5990am
			6040na	7180as	11970na
2300	0000		Costa Rica, University Network	13750va	
2300	0000		Cuba, Radio Havana	9550am	
2300	0000		Egypt, Radio Cairo	11885na	
2300	0000		Germany, Deutsche Welle	6070as	9555af
			9815as		
2300	0000	DRM	Germany, Deutsche Welle	9800na	
2300	0000	vl	Ghana, Ghana BC Corp	3366do	4915do
2300	0000		Guyana, Voice of	3291do	
2300	0000		India, All India Radio	9705as	9950as
			11620as	11645as	13605as
2300	0000		Malaysia, Radio	7295as	
2300	0000	vl	Namibia, Namibian BC Corp	3270do	3290do
			6060do	6175do	
2300	0000		New Zealand, Radio NZ Intl	17675pa	
2300	0000	DRM	New Zealand, Radio NZ Intl	15720pa	
2300	0000		Papua New Guinea, Catholic Radio	4960do	
2300	0000		Papua New Guinea, NBC	9675do	
2300	0000	vl	Papua New Guinea, Wantok R.Light		7120va
2300	0000	irreg/ vl	Sierra Leone, SLBS	3316do	
2300	0000		Singapore, Mediacorp Radio	6150do	
2300	0000	vl	Solomon Islands, SIBC	5020do	9545do
2300	0000		Turkey, Voice of	5960va	
2300	0000		UK, BBC World Service	3915as	5965as
			6195as	9605as	9740as	11945as
			11955as		
2300	0000		USA, AFRTS	4319usb	5446usb	5765usb
			7590usb	7812usb	12133usb	12579usb
			12133usb	12579usb	13362usb	13855usb
2300	0000		USA, KAIJ Dallas TX	13815na	
2300	0000		USA, KTBN Salt Lake City UT	15590na	
2300	0000		USA, Voice of America	6180va	6235as
			7205va	9780va	11655va	13640va
			15150va		
2300	0000		USA, WBCQ Kennebunk ME	5110na	7415na
			9330na		
2300	0000		USA, WBOH Newport NC	5920am	
2300	0000		USA, WEWN Birmingham AL	7540va	7560va
			9975va	11830va	
2300	0000		USA, WHRA Greenbush ME	5850na	6195na
2300	0000		USA, WHRI Noblesville IN	7315am	7490am
			15665am		
2300	0000		USA, WINB Red Lion PA	9320am	
2300	0000	mtwhf	USA, WRMI Miami FL	7385am	
2300	0000	as	USA, WRMI Miami FL	9955am	
2300	0000		USA, WTJC Newport NC	9370na	
2300	0000		USA, WWCR Nashville TN	5070na	7465na
			9985na	13845na	
2300	0000		USA, WWRB Manchester TN	6890na	
2300	0000		USA, WYFR Okeechobee FL	11740am	15255va
			17750va		
2300	2315		Nigeria, Radio/Kaduna	4770do	6090do
2300	2315		Nigeria, Radio/Lagos	3326do	
2300	2315		USA, WYFR Okeechobee FL	11875af	
2300	2329		Canada, Radio Canada Intl	6160as	7195as
			9730as		
2300	2330		Australia, Radio	15240as	
2300	2357		Romania, Radio Romania Intl	7105eu	9610eu
			9640eu	11730eu	
2300	2359		Canada, Radio Canada Intl	6100am	
2315	2330	vl	Croatia, Croatian Radio	7285va	
2330	0000		Australia, Radio	15415as	17750as
2330	0000		Burma, Dem Voice of Burma	5955eu	
2330	0000		Lithuania, Radio Vilnius	7325na	
2330	0000		UK, BBC World Service	3915as	5965as
			6035as	6170as	6195as	9605as
			9740as	11945as	11955as
2330	2357		Czech Rep, Radio Prague Intl	5930na	7345af
2335	0000	sm	Austria, Radio Austria Intl	9870sa	
2345	2358	twhfa	Austria, Radio Austria Intl	9870sa	

Land Mobile Radio News

According to a recent General Accounting Office report released on December 1, 2005; the Department of Defense (DoD) is deploying new Land Mobile Radios (LMR) to military installations across the country. These new land mobile radios operate in the 380-399.9 MHz range, a frequency range previously reserved for military aeronautical communications only.

While this is not news to regular readers of this column (we were, after all, the first radio hobby column to uncover this new LMR band), official details about the uniformed services' shift to this frequency range have been very sketchy.

Some of the new details uncovered in the December GAO report and other open source literature includes:

- DoD received certification from the NTIA in 2003 to operate this new LMR subband in the milair frequencies range. DoD began rolling out the system in 2004 and started it with the U.S. Army National Capitol Region system in Washington, D.C.
- 120 systems will rollout between 2004 and 2008. Only 15 states will not be getting these new military trunk systems.
- The new DoD 380-399.9 MHz radio systems meet current NTIA requirements for new spectrum narrow banding technologies (APCO digital).
- The new systems will have interoperability between installations.
- These two-way radio systems will support law enforcement, force protection, fire, transportation management, medical duties, and first responders functions on military installations.
- DoD chose this solution to its spectrum shortfalls because other government bands in the spectrum could not accommodate their trunk system requirements.

We have also been told privately by D.C. insiders that DoD was tired of fighting other federal agencies for space for their trunk radio systems in the existing government LMR bands, so they created their own new LMR spectrum in a band that they have almost exclusive control over, the 225-400 MHz military aeronautical band.

According to the GAO report, DoD expected these new 380-399.9 MHz LMR systems to be operational at 36 locations in nine states and the District of Columbia at the end of fiscal year 2005 (October 1, 2005). And by fiscal year 2010, DoD will have moved 137 installations in 28 states to this new LMR band.

Based on field reports, official government documents, civilian equipment manufacturer press releases, and other public domain sources, we are aware of new trunk systems installed or underway at the following DoD installations:

Camp Pendleton, California (additional sites in Los Angeles area)
Carlisle Barracks, Pennsylvania
Defense Distribution Depot (DDSP) Susque-hanna, Pennsylvania (near New Cumberland)
Dover Air Force Base, Delaware
Eglin Air Force Base, Florida
Fort A. P. Hill, Virginia
Fort Benning, Georgia
Fort Bragg, North Carolina
Fort Detrick, Maryland
Fort Meade, Maryland
Fort Sill, Oklahoma
Great Lakes Naval Base, Illinois (will deploy system in 2007)
U.S. Army, National Capitol Region, Washington, District of Columbia. Note: Joint National Capitol Region (J-NCR) and NDW, Phase II, Washington, DC (will deploy system fully in 2006)
Marine Corps Base Quantico, Virginia
Naval Support Base, Mechanicsburg, Pennsylvania
Navy Region Northwest, Washington
Walter Reed Army Medical Center, Washington, District of Columbia
West Point Military Academy, New York

Bottom line: if LMR communications at your neighborhood military base disappear, it is time to check out the 380-399.9 MHz range for some new communications frequencies.

❖ Going Conventional

Up until now, we have received field reports of only trunk radio systems operating in this new band. Now our intrepid west coast reporter, *Fed File* columnist Chris Parris, reports from Portland that there are conventional frequencies being heard in this range as well.

Chris says, "I spent some additional time monitoring the base today and determined that the Air National Guard base at KPDX (*Portland International Airport-lvh*) is indeed using some 380 MHz conventional channels for base operations. They used to operate on 413 MHz allocations, but most of those have either gone quiet, or possibly been taken over by the Air Force Reserve unit at Portland International."

Here is what Chris found to be in use so far:

385.3750 110.9 pl   Analog, Security Police

387.8500 162.2 pl   Analog, Fire Rescue
387.8857 141.3 pl   Analog and P-25 digital, Aircraft Maintenance

Chris says the Fire/Rescue folks are also still using 413.3000 MHz, as it is tied in to the Portland 800 MHz public safety trunked system. So, apparently the new 380 MHz DoD allocations are not always digital (just narrowband) and not always trunked!

❖ Navy Region Northwest

Based on open source literature, the new 380-399.9 MHz trunk system spotted in the Seattle area is probably managed by the U.S. Navy, and is known as the Navy Region Northwest system. Here is the latest frequency information on that system, also from my colleague Chris Parris.

Site	Frequencies
Site 101	385.0625/395.0625
Site 102	385.3125/395.3125
	385.9000/395.9000
	386.0125/396.0125
Site 103	386.1250/396.1250
Site 104	386.1875/396.1875
Site 105	385.3500/395.3500
	385.9125/395.9125
	386.0625/396.0625
	386.6625/396.6625
	386.8000/396.8000
Site 106	385.0125/395.0125
	386.4125/396.4125
	386.6125/396.6125
	386.8125/386.8125
Site 107	386.3500/396.3500
Site 108	385.8875/395.8875
	386.3375/396.3375
	386.6375/396.6375
Site 109	386.1000/396.1000
Site 110	386.6750/396.6750
	386.8250/396.8250
Site 111	386.0750/396.0750
	386.2250/396.2250
Site 112	386.1625/396.1625
	386.7625/396.7625

❖ J-NCR Phase II Contract Awarded

M/A-COM recently announced that the company was awarded a $4.75 million contract by the U.S. Army's Assistant Project Manager for Land Mobile Radio to provide a fully interoperable radio network for the U.S. Navy, with future potential for training, options and maintenance.

The contract for the Joint National Capital Region (J-NCR) Land Mobile Radio (LMR) Phase II system will provide the Naval District Washington (NDW) with a new state-of-the-art

LMR communications network solution. Using M/A-COM's P25IP Trunked Internet Protocol (IP) Communications System, in combination with the NetworkFirst Interoperability solution, this system is one of the first Department of Defense LMR deployments in the United States to simultaneously serve the U.S. Army, Navy, and Air Force

The contract is Phase II of a "turnkey," completely integrated LMR system. Phase I, which also featured M/A-COM's P25IP system and NetworkFirst solution, linked the critical communications systems of approximately 3,000 Army base personnel in 11 separate Army installations in the J-NCR region. The combination of the J-NCR Phases I & II will link nearly 30 Department of Defense installations (17 Navy installations, 11 Army bases and Bolling Air Force Base), interoperating with more than 100 entities across the region.

The system will provide base radio communications for many thousands of DoD users while facilitating interoperable communications with civilian public safety agencies located in four states (Maryland, Virginia, New York and Pennsylvania). These agencies are currently communicating on different frequencies and have disparate radio systems throughout the J-NCR and NDW region.

"M/A-COM is proud to continue our successful eight-year partnership with the Navy to provide NDW and J-NCR with a powerful multi-service solution that is fully compliant with P25 trunking standards," said Kevin Fleming, director of federal sales at M/A-COM. "Our P25IP trunking system, in combination with our NetworkFirst technology, will leverage Commercial-Off-the-Shelf (COTS) equipment to supply J-NCR with the most cost-effective solution available, while providing full interoperability with all existing state, federal and metro Washington, DC first responders."

The digital system supports P25 trunking standard voice and data features including AES encryption. This system will operate using Department of Defense UHF spectrum in the 380-399.9 MHz frequency range. Additionally, the system is JF12 certified and meets the National Telecommunications and Information Administration (NTIA) 12.5 kHz Narrowband mandate and the guidelines set forth in the Deputy Secretary of Defense's Policy Letter for LMR Systems.

"We are pleased to provide the Department of Defense with a wide-area LMR system that offers the significant benefits of an IP system including scalability, interoperability, flexibility as well as seamless roaming, that meets and surpasses current Homeland Security, Federal and military LMR standards and specifications," said Jay Herther, federal market director at M/A-COM.

"Through the unique technical capabilities of M/A-COM's NetworkFirst and P25IP technology, the J-NCR system is the blueprint for the present and future of federal radio communication. This system has virtually identical mission critical communication requirements as the upcoming Integrated Wireless Network (IWN) program, a collaborative effort by the Departments of Justice, Homeland Security, and

the Treasury to provide a consolidated, nation-wide federal wireless communications service for public safety first-responders throughout the country."

❖ Westover P25 Updates

Our New England friend "The Researcher" checks in with the following update on P25 activity at Westover ARB/Metropolitan Airport.

142.45 Simplex (also repeatered)

"Apparently the Communications Squadron (radio maintenance) must have some incorrect NAC's programmed into their radios, because they were testing from the 'Dog Patch' area back to their shop (which is actually co-located next to the base repeater site on radar hill). Base could talk to portable base, but none of them were talking through the repeater. In fact, there were indications that the repeater had been turned off and they were just seeing how well portables/portable, base simplex to portable, and portable base to base/portables were working. Their conclusion was that the portables had to be out of the buildings at Dog Patch in order to hit the base station on radar hill."

139.2375 Repeater

"Definitely being used by Civil Engineer Pavement and Grounds for snow removal operations (got the brooms out there). They also use 149.0375 simplex when they are out on the runways to communicate with tower/ground control."

Thanks for that report, Researcher, and we look forward to future updates on the new frequencies at Westover.

❖ Milair Frequency Updates

Finally, Jack NeSmith, files this report on the latest frequency milair frequency changes.

Allen Army Airfield [Delta Junction/Fort Greeley, Alaska] (PABI)

122.900	Allen Operations
135.650	Weather ASOS
251.050	Ground Control

Hurlburt Field, Florida (KHRT)

123.975	Air/Ground Facility

Other selected aero frequencies for Hurlburt from our mil frequency files:

5732/11611.5 kHz	Seminole Ops
120.200/346.400	Approach/Departure Services (Jacksonville ARTCC Crestview RCAG)
126.500/291.100	Control Tower
132.100	Eglin Approach/Departure Control
134.100	Radar
139.600/275.800	Ground Control
140.400/251.250	Command Post
360.675	ATIS
372.200	Pilot to Dispatcher
390.750	PMSV Metro

Moody Air Force Base, Georgia (KVAD)

381.050	Alternate Command Post

Other selected aero frequencies for Moody our mil frequency files:

119.525/259.300	Valdosta Approach/Departure Control
120.625/275.800	Ground Control
126.600/285.600	Valdosta Approach/Departure Control
127.925/233.700	Basic Radar
128.450/257.625	Control Tower
132.300/290.400	Jacksonville ARTCC
139.300/227.200	Single Frequency Approach Pilot to Dispatcher
143.825/305.600	Safety of Flight
263.450	PMSV Metro
269.400	Radar
296.000	Radar
273.500	ATIS
301.500	Radar
316.700	Radar
322.700	Radar
372.200	Pilot to Dispatcher
381.300	AFSOC Command Post "Angel Ops"
389.800	Radar
395.000	Radar

Kaneohe Bay Marine Corps Airfield, Hawaii (PHNG/NGF)

263.100	Approach Frequency (ex-263.150)
346.200	Control Tower Secondary (ex-379.250)

Other selected aero frequencies for Kaneohe our mil frequency files:

120.700/360.200	Control Tower/Common Traffic Advisory Frequency (CTAF)
124.100/317.500	Honolulu ARTCC
125.000/263.100	Kaneohe Approach/Departure Control
266.800	Honolulu ARTCC
284.500	ATIS
286.000	Honolulu ARTCC
294.700	Clearance Delivery
307.200	Pilot to Dispatcher
315.600	Honolulu ARTCC
344.600	PMSV Metro
382.800	Ground Control

Barksdale Air Force Base, Louisiana (KBAD)

278.300	Control Tower

Other selected aero frequencies for Barksdale our mil frequency files:

118.600/350.200	Shreveport Approach/Departure Control
119.900/335.550	Shreveport Approach/Departure Control
121.800/275.800	Ground Control
128.250/236.600	Control Tower
311.000/321.000	Command Post "Raymond 6"
372.200	Pilot to Dispatcher
373.625	PMSV Metro
375.800	ATIS

And that does it for this month in the world of *Milcom*. Next month we will have our annual airshow column with frequencies, equipment, and schedules to prepare you for the 2006 airshow season.

In the April edition of *Milcom* I hope to again pick up with our nationwide ARTCC list which was bumped this month due to space constraints. Until next time, 73 and good hunting.

A M BANDSCAN

State-by-State: Pacific Northwest

The Pacific Northwest is the "Holy Grail" of BCB DX for Easterners. Despite decades of DXing from several locations, I've only heard <u>two</u> stations from these states. Persistence – and luck – will be necessary to fill in these gaps in your DX map.

Washington:

One of my two Pacific Northwest loggings is from Washington State. KGA-1510 Spokane managed to make the trip, despite an antenna pattern that really shouldn't favor Tennessee, and the presence of 50,000-watt WLAC on the same frequency less than 20 miles from my location. I suspect there was a temporary problem with KGA's antenna system at the time, as DX reports of this station have been scarce recently. Still, KGA is worth a try just before Spokane sunset (7:15pm Central time in February).

There are a number of 50,000-watt stations in Seattle. KIRO-710 and KOMO-1000 are non-directional during the day and may be worth looking for at Seattle sunset (7:30pm Central). KOMO is occasionally reported heard in the East, unfortunately not by me! Also in northwest Washington State, KRPI-1550 Ferndale is directional during the day but with a pattern that favors the East. KRPI will stand out on the dial; they broadcast in Punjabi to an audience across the border in Vancouver, Canada. Also on 1550 with 50,000 watts is nostalgia outlet KKAD in the other Vancouver, the one in southwest Washington across the river from Portland, Oregon.

KTTH-770 and KPTK-1090 are also 50,000 watts but their daytime patterns don't favor Eastern reception. Finally, the Seattle area is home to two expanded-band stations. KYIZ-1620 carries an urban-contemporary format. KTFH-1680 is multilingual.

Oregon:

Oregon and Washington have a lot in common. Unfortunately, difficulty of reception is one of these states' shared characteristics! As in Seattle, Portland has plenty of powerful AM stations but none of their directional patterns favor the east.

Your best bets are KPAM-860 and KEX-1190. Both stations are 50,000 watts, non-directional during the day, and both are news/talk outlets. All sports KFXX-1080 is directional during the day, but their directional pattern is not particularly unfavorable. KXL-750 may be worth a try from other Western points but is going to be pretty difficult from the East. Oregon is also home to one expanded-band station. KDZR-1640 is a Radio Disney station. (Don't confuse it with the

Milwaukee-area Disney station, also on 1640.)

Idaho:

The Gem State has become a bit easier of late, but it's still no cakewalk. The state's sole station running 50,000 watts at night is KBOI-670, and their pattern is <u>very</u> tight towards the east, protecting Chicago. However, KBOI is well worth a try before Boise sunset, when they're still on non-directional daytime facilities. For Western DXers, Idaho became considerably more difficult when the Iranian station in Southern California came on the air and KBOI cut back its signal in that direction.

A second 50,000-watt station has recently come on the air in the Boise suburb of Meridian. KDJQ-890 cuts power to 250 watts at sunset but has been heard on day facilities as far east as Chicago. They've recently switched from oldies to a Spanish-language format.

Your third choice (and maybe best bet) for Idaho is KBLI-1620. The state's only expanded-band station recently switched languages in the opposite direction from KDJQ; they dropped Spanish-language programming in favor of ESPN sports.

Montana:

Big Sky Country is the other Pacific Northwest state that's made the trip to my receiver, but only when I lived in Wisconsin. KGHL-790 is the station; their 5,000-watt signal is non-directional by day and favors the East at night. I've seen this station reported by others recently. That doesn't mean it's easy, though!

The state has two stations running 50,000 watts non-directional during the day: KOFI-1180 Kalispell and KERR-750 Polson. Both stations cut power and beam away from the East at sunset. KJJR-880 and KATL-770 are both 10,000 watts non-directional daytime, and KSEN-1150's 10,000-watt daytime pattern favors the East. Sunset is the time to be looking for this state.

Maybe the most frustrating thing about DXing the Pacific Northwest is the relative ease of DXing nearby Canadian stations! High River, Alberta, is scarcely 130 miles from the Montana border, but CHRB-1140 there is frequently received as far east as New England. Calgary's CFAC-960

("Fan 960") has been heard booming in on a cheap portable here in Nashville. 770 CHQR there has also been widely heard. Further north in Alberta, CHQT-880 "Cool 880" Edmonton is a common DX target. (CHQT is probably the most northerly station many DXers will ever hear.)

British Columbia is much more difficult to log than Alberta, but much easier than adjoining Washington State. CKWX-1130 is the most often reported Vancouver station; I've heard it here several times. Also heard here is CBU-690, though not since Montreal returned to the air. Don't confuse CBU with the French-language Canadian stations on this frequency – one of which is Montreal, the other a CBC outlet in Saskatchewan.

❖ TV Powers

Reader Edwin Goad, K4AUH of Charlotte NC wrote with a number of good questions and comments. I'll be addressing them over the next few months – there's too much for a single column!

"I recall that the first TV stations had audio transmitter ERP [effective radiated power] that was 40 to 50 percent of the video ERP. My recent checks indicate that the audio power is now around 10 percent of the video."

Yes, as recently as 1966 approximately half of TV stations had aural powers half that of the video. Today, aural powers are much lower. FCC regulations limit aural power to no more than 22 percent of visual. I've seen powers as low as 5 percent, but 10 percent seems the most common figure. This will become a moot point in a few years, when analog TV is shut down. In digital TV, the audio is transmitted along with the video, over the same transmitter and at the same power.

❖ More North-of-the-Border News

Canada will indeed be losing its last daytime-only AM station. CKOT-1510 Tillsonburg, Ontario, held that title. In late August, their application to move to FM was approved – but the 104.7 frequency requested was awarded to a different applicant. Alternate frequencies 94.3 and 107.3 were suggested.

On the other hand, a new AM station has been approved for Vancouver. CJRJ-1200 will operate with 25,000 watts fulltime, directional. CJRJ will join two U.S. stations just across the border in serving the Vancouver area's Hindustani and Punjabi populations.

Many CBC stations, especially in central Canada, have abandoned the AM band in favor

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Best Bets for Logging the Pacific Northwest:

Washington:	KGA-1510, KOMO-1000
Oregon:	KPAM-860, KEX-1190
Idaho:	KBOI-670, KDJQ-890, KBLI-1620
Montana:	KGHL-790, KSEN-1150

of FM operation. The CBC has filed for six new FM stations in the Prairie Provinces; however, these stations will <u>supplant</u> existing AM service rather than replacing it. Stations in Edmonton, Calgary, Saskatoon, and Winnipeg will relay both the English and French services.

❖ IBOC news

IBOC continues to spread like wildfire on FM. Many new IBOC-FM stations are adding "HD2" second program streams. On AM, the latest new major IBOC outlet is KYW-1060, Philadelphia. It will be interesting to see what this does to reception of NYC's 1050 station in northern New Jersey.

I note the J&R Music World catalog that appeared in my mailbox in late October offers a wide variety of SIRIUS and XM satellite radios, and quite a few models of regular analog sets – and not a single IBOC receiver...

❖ More New Stations

Nevada is a tough catch. Patrick Griffith has heard, and verified, a new Silver State station. KHWG-750 Fallon is "The Hawg," with country music. They told Patrick they were running 7,500 watts when he heard them but expected to increase to their authorized 10,000 by the time you read this. If you hear KHWG, they can be verified via 1050 W. Williams Ave., Fallon NV 89406.

❖ State of the Dial

The FCC periodically releases "Broadcast Station Totals," a summary of the number of authorized stations of each type. From the end of 1996 to July of 2005, the total number of authorized broadcast stations increased 12 percent, from 20,601 to 22,989.

The greatest growth was in FM translator (relay) stations, up 44% from 2,720 to 3,906. This growth would have been considerably greater if the FCC hadn't placed translator applications on hold. (A quick look at the FCC Database shows nearly 25,000 FM translator applications on file! Admittedly, many of them are mutually exclusive; far fewer than 25,000 new stations are possible.)

Also up significantly are non-commercial FM stations. The count increased from 1,864 to 2,585 – an increase of 39 percent. This trend and the trend among FM translators are related. Most of the growth is among religious stations, and much of that involves a small number of organiza-

Station totals, 1996 vs. 2005

Broadcasting is growing in some areas – and shrinking in others.

tions with hundreds of stations.

But there's been solid growth among regular commercial FM stations as well. The count has increased from 5,419 to 6,213 for an increase of 15%. Computerized "data mining" has made it possible to find channel assignment possibilities that may have been difficult or impossible to locate with old manual techniques. "Move-ins," where a station moves from a rural community into a nearby city, often make possible the creation of new stations in the rural areas abandoned by the moving stations.

There are two categories of station that have seen <u>fewer</u> licenses over the last nine years. Neither is a surprise. The popularity of cable and satellite TV has made TV translators far less important than they were in the 1960s. Many translator licenses have been allowed to expire; others don't seem interested in moving to new channels when their existing channels are lost to digital TV. TV translators are down 9 percent, from 4,952 to 4,491. Also not a surprise is the decline in the AM service. 98 AM station authorizations were cancelled over the nine-year period – a 2 percent decline from 4,857 to 4,759.

❖ Really Long DX

Early fall saw a number of excellent trans-Atlantic openings; European signals were logged as far west as Oregon. For only the second time ever, I heard European AM audio at my location near Nashville. The best signals seemed to come from the Talksport network (numerous U.K. transmitters, on 1089 kHz) and Croatia (1134 kHz). The best frequencies to DX seem to vary considerably with location, though.

Some trans-Atlantic frequencies to try for would include 1053 and 1089 kHz (Talksport, U.K.); 1134 kHz (Croatia); 1530 kHz (VOA Sao Tome); and 1521 kHz. The latter is a 2,000,000-watt (yes, 2 million watts!) station in Saudi Arabia that frequently generates a 1 kHz "het" tone against Buffalo's WWKB.

If, right after sunset, you start hearing high-pitched tones that aren't normally there on your AM dial, there may be an European opening in progress. West Coast DXers may observe similar "hets" in the morning; Japanese and Australian stations are the likely culprits.

❖ 'Til Next Month

Hearing anything interesting? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to **dougsmith@monitoringtimes.com**. Good DX!

BOATS, PLANES, AND TRAINS

PLANES

Iden Rogers
idenrogers@monitoringtimes.com

NAVAIDS – Some Talk, Some Don't

A NAVAID is a radio aid to navigation. There are many different types, and their frequencies appear at widely different locations within the radio spectrum. Their signals are used to produce various cockpit instrument presentations which help the pilot find his or her way.

The radio traffic we hear as hobbyists includes spoken references to NAVAIDS, so some understanding of them is helpful. Also, certain ones transmit voice in addition to their navigational signals. Let's start with the oldest type.

❖ Non-Directional Radio Beacons (NDBs)

Some aircraft communications listeners may not have thought much about NDBs, or "beacons," as they are often called. They, and marine beacons, are mostly in 200-430 kHz range (yes, kilohertz), below the AM broadcast band on what's called Long Wave. They tirelessly identify themselves by sending their call letters over and over in Morse code, using from one to three letters, although some Canadian beacons use a letter and a number.

Automatic Direction Finder (ADF) receivers, used to tune in NDBs, allow pilots to employ several different navigating techniques. ADF receivers can also use regular AM broadcast station signals in the 540-1700 kHz range (Medium Wave). A cockpit instrument shows the station's magnetic bearing in degrees. One website with some interesting info about NDBs and ADF is at **http://flyawaysimulation.com/contentid-11.html**

NDBs are one of many different kinds of NAVAIDS used by pilots. NDBs are old technology, started in the 1920s, but they are still in use. They replaced rotating light beacons along relatively few established courses of flight. NDBs are now often used as a back-up system to other NAVAIDS or in remote areas where that's all there is. NDBs are shown on aeronautical charts: In a box near an NDB symbol, it shows the frequency in kHz, along with the call letters and name.

The line under the frequency in the box means that this NDB has no voice. Some years ago, a portion of NDBs would transmit prere-

corded aviation weather in voice, but sadly that is rare today. It was fun at night to tune around and get weather info from different areas.

Most airports of any size have several different published Instrument Approach Procedures (IAPs), each based on a particular NAVAID type, but many do not have an NDB Approach. The trend is to replace them with newer and more precise technologies.

DXing NDBs – With great enthusiasm, some hobbyists DX NDBs and try to log as many as possible and from as far as possible. Distance reception is best at night in the winter. For info on this aspect of listening, see: **http://beacon-world.org.uk/** The website at AirNav.com at **http://www.airnav.com/navaids/** can be a very helpful tool – just enter the call letters. The *Below 500 kHz* column in this magazine and the *Beacon Guide* compiled by columnist Kevin Carey is also a good resource. For a captivating narrative on beacon DXing, see: **http://www.geocities.com/ko6bb/**

Many general coverage receivers include this range. The Icom R75 **http://www.grove-ent.com/ICR75.html** works well and is a good value for the money.

❖ VHF Omnidirectional-Range (VOR)

When aircraft listeners think of the "VHF aircraft band," they usually think of the 118-137 MHz band. This is the band where civilian and some military communications take place over land. Most scanners extend aircraft band reception down to 108 MHz, so what happens between 108 and 117.95 MHz?

VOR and the VOR component of both VORTAC (VOR/Tactical Air Navigation) and VOR/DME (VOR/Distance Measuring Equipment) navigational stations exist in this range. TACAN (military) and DME both provide VOR-to-aircraft distance information to the pilot if the aircraft is so equipped.

When you tune in a VOR that is reasonably close to you, you will hear a fast warble of sorts and the call letters in Morse Code or via code and recorded voice. The call letters may be looked up using the above-mentioned AirNav.com link.

Navigational signals from a VOR station can be visualized by thinking of a bicycle wheel held parallel to the ground (without rim) with 360 spokes – one spoke for each degree. Each of these spokes is called a "VOR radial." The aircraft VOR receiver, tuned to a specific VOR, will indicate the degree radial that the aircraft is following to or from the VOR. The system of

VORs across the country plays a major role in today's aero navigation and marks a significant advance over NDBs.

IFR (Instrument Flight Rules) Enroute High Altitude and Low Altitude aeronautical charts show multitudes of airways, segments of which are defined by a specific VOR outbound radial and the inbound radial of another VOR, thus forming a straight line between the two VORs or creating intersections of radials from two VORs. An informative VOR navigation link is **http://www.allstar.fiu.edu/aero/VOR.htm**

VORs with Voice? Do some VORs have voice transmissions on them in addition to the ones with a verbal ID? Yes, they do, and some listeners may have not explored them! Let's take a look.

Hazardous Inflight Weather Advisory Service (HIWAS) is transmitted from selected VOR sites. This is essentially continuous, pre-recorded and periodically-updated aviation weather. It can include "summarized AWW's, SIGMET's, convective SIGMET's, CWA's, AIRMET's, and urgent PIREP's." In simple terms, it warns of weather that can affect the safety of aircraft in flight – turbulence, severe icing, dust or sandstorms, tornadoes, thunderstorms, etc. To explore the above and other aero terms see **http://www.faa.gov/atpubs/PCG/INDEX.HTM**

The Williams, California, VORTAC on 114.4 MHz with call sign of ILA is an example of a VOR station with a continuous HIWAS broadcast. When looking it up, scroll to the bottom and under "Remarks" it says, "HIWAS BROADCAST." Your area may have one or more such stations transmitting weather info.

On aero charts, the info box near a VOR symbol with the letter "H" in the corner means that the VOR transmits voice HIWAS. A letter "T" means that it transmits voice TWEB (Transcribed Weather Broadcast).
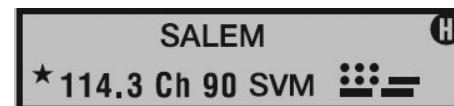
Automatic Terminal Information Service (ATIS) can be found on some VOR stations; otherwise they are in the 118-136 MHz band. These continuous pre-recorded, but updated broadcasts tell pilots about important airport information so they don't have to use air time to get it from the Air Traffic Controllers. Go here **http://www.bayareapilot.com/ATIS.htm** for a good description of ATIS. ATIS broadcasts often have information of interest to hobby listeners.

An example of a VOR station with ATIS is San Francisco International Airport shown at **http://www.airnav.com/airport/KSFO** San Francisco has four ATIS broadcasts, and from the frequency listing you will see that two of them are VORs with voice, "ATIS: 113.7, 115.8" (MHz). If you scroll down a little more, you will see the list of VORs associated with the airport. The frequency 113.7 corresponds to "PYEr123/36.2 POINT REYES VORTAC 113.70." Similarly, 115.8 corresponds to "SFO at field SAN FRANCISCO VOR/DME 115.80." The latter is at the airport, whereas the airport is 36.2 NM (Nautical Miles) from PYE on the 123 degree radial (123 degrees from the VOR with North being zero degrees, 90 degrees being East, etc.) from the center of the VOR.

Automated Weather Observing System (AWOS) broadcasts are sometimes found on VORs; otherwise they are also in the 118-136 MHz band. These unmanned stations report Airport Identifier, Zulu Time, Sky Conditions, Visibility, Wind Speed, Wind Direction, Temperature, Dew Point, Altimeter Setting, Density Altitude, and Wind Gusts in an automated voice in almost real time. For more info on AWOS, see **http://www.faa.gov/asos/awosinfo.htm** and for an example of an airport that does this, see Sacramento International Airport at **http://www.airnav.com/airport/KSMF** where it lists, "WX AWOS-3 at MCC (9 nm E): 109.20."

From what you learned above, you can see that it refers to "MCCr264/8.9 MC CLELLAN VOR/DME 109.20" with the airport being located 8.9 NM from the VOR on the 264 degree radial. The VOR call sign is MCC and the name is Mc Clellan.

Similar to the info box with the letters "H" and "T," mentioned above, a VOR that transmits AWOS or ASOS (Automated Surface Observing System), will have a letter "A" up in the corner.

Flight Service Stations (FSS) show up on VORs as well, in addition to being found on 122.0, 122.2, 122.3, 122.4, 122.6, and 123.6 MHz.

From the FAA *7110.10 Flight Services* publication at **http://www.faa.gov/atpubs/** it says, "FLIGHT SERVICE STATION − Air traffic facilities which provide pilot briefing, en route communications and VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen, broadcast aviation weather and NAS information, receive and process IFR flight plans, and monitor NAVAIDs. In addition, at selected locations, FSSs provide En Route Flight Advisory Service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights."

It is not uncommon for pilots to talk back to VORs; well, sort of. In the next image, you see "122.1R." This means that the FSS is remotely listening/receiving on 122.1 via the VOR location and that the pilot transmits to the FSS on 122.1. The pilot must then listen on 109.0 MHz, in this case, on his/her VOR receiver. This is one of the few instances in aircraft communications where the two sides of the conversation are on different frequencies. Other VOR-associated, receive-only frequencies can be 122.05, 122.15, and 123.6

MHz, which will instead appear above the VOR info box on a chart.

122.1R
IDAHO FALLS
109.0 Ch 27 IDA

Sometimes a name will appear below the box which indicates the particular FSS providing the service. Talking through VOR sites and other Remote Communication Outlets (RCOs) extends the reach of FSS services to areas distant from the physical, manned FSS location.

The proper radio phraseology to call an FSS is to use the word "Radio." Let's say, in a certain part of Ohio a pilot wants to talk to the Dayton FSS. The pilot would start by saying, "Allen County Radio, ….." − based on a chart or on a textual reference that might read: "ALLEN CO, OH RDO - 108.4T 122.1R (DAYTON FSS) VOR-T 108.400 AOH." The pilot would transmit on 122.1 and listen on 108.4. It is a Class "T" VOR ("Usable to 25 NM at 12000' AGL" − Above Ground Level). The call letters are AOH.

Other voice transmissions can show up on a VOR. Here is an example from Dillant-Hopkins Airport in Keene, New Hampshire. At **http://www.airnav.com/airport/KEEN** you will find Clearance Delivery: "CLNC DLVY THRU BANGOR AFSS (BGR) ON FREQ 122.1R/109.4T."

So, when the urge strikes, see what, if anything, the VORs local to you are saying and give 122.1 an extended listen or put it in a scan sequence in your scanner.

Charts, Chart Symbols, Publications − The above chart symbols are courtesy FAA and from the PDF publications which can be downloaded here **http://www.naco.faa.gov/index.asp?xml=naco/online/** For charts and other neat FAA/NACO & DoD publications, see **http://naco.faa.gov/index.asp?xml=naco/ecom** and click on "Public Online Ordering."

❖ Instrument Landing System (ILS)

Approach Control: "United One Eighty-Nine, cleared for ILS Runway One Six Right Approach, report when established on localizer."

The purpose of ILS is to provide pilots with precise lateral and vertical guidance during final approach and landings, with the desired outcome of bringing them to the centerline of the end of the runway just before touchdown. There are three components to the ILS system: Localizer,

These two instruments look very similar but they are driven by quite different NAVAID systems. The left instrument is for ADF and the right is for VOR-Localizer-Glideslope. Photos courtesy: Honeywell Bendix/King.

Glideslope, and Marker Beacon(s).

The Localizer component of the ILS system is in 108.1-111.95 MHz band segment and on odd tenths like 108.7, 110.3, etc. The Localizer frequencies are paired with Glideslope frequencies which are in the 328.6-335.4 MHz range. Marker Beacons are on 75.0 MHz.

You can tune around for these ILS signals and you may find some − but no voice here. For ILS info: **http://stoenworks.com/Tutorials/ILS%20Approaches.html**

❖ Global Positioning System (GPS)

The Department of Defense (DoD) created the GPS, composed of a minimum of twenty-four satellites at orbit altitudes of about 11,000 miles, to help provide solutions for its own military needs. It was only natural that it would become a major player in aircraft navigation, since the system provides accurate, three-dimension position, velocity, and course information all over the world. For interesting, general GPS info: **http://en.wikipedia.org/wiki/Global_Positioning_System**

Much of today's enroute navigation is from VOR to VOR with a few NDBs sometimes tossed into the mix. With GPS navigation, the limitations imposed by many of the ground-based navigation stations are gone. And, no, GPS satellites don't talk.

Until Next Time − Tune around, listen, figure stuff out, takes notes, and have fun!

Prime Time

In North America, the month of February often brings the best longwave (LW) listening of the year. It's not so much that signals are stronger, but you won't have to deal with the horrendous storm static that prevails during the warmer months. In general, the signal-to-noise ratio is much higher now, and this makes for better DXing below 500 kHz.

This month, let's focus on targets in the Caribbean and South America. These regions give many beacon hunters their longest intercepts ever, with receiving distances of 4000 miles or more being reported under good conditions.

A directional antenna such as a loop certainly helps when trying to snag DX stations. Often, it will allow you to null a competing station and focus on a desired (and weaker) beacon signal. However, if you use a simple wire antenna, don't despair. Many times nature creates its own "directivity," allowing stations from one region to boom in for an hour or so, and then fade out, only to be replaced by signals from a completely different direction.

Table 1 is a collection of winter loggings from *MT* readers over the years. There is no guarantee that all of these can be heard from a particular location, but it does give you some targets to try for.

TABLE 1. SELECTED DX LOGGINGS

FREQ.	ID	LOCATION
212	UCF	Cienfuegos, Cuba
232	GT	Grand Turk Isle, BWI
232	UMZ	Manzanillo, Cuba
260	TOY	Tongoy, Chile
300	SM	San Marcos, BRAZ
318	SSB	San Sabastian, VEN
326	BHF	Freeport, BAH
330	CZM	Cozumel, MEX
353	HOT	Higuerote, VEN
360	KIN	Kingston, JAM
370	UCM	Camaguey, Cuba
376	ZIN	Great Inagua, BAH
400	PIE	Bucaramanga, COL
405	BVI	Boa Vista, BRAZ
415	CBC	Cayman Brac, BWI
415	SLS	Salinas, ECU
450	PPA	Puerto Plata, D. REP
526	ZLS	Stella Maris, BAH

❖ Lowfer Roundup

Each winter we present an updated listing of low power stations known as Lowfers – short for Low Frequency Experimental Radio Stations. February is a great time to try for these stations, since natural static (QRN) levels are almost nil in most parts of North America. These stations are usually very weak, so the absence of noise is a crucial element to listening success.

For those unfamiliar with Lowfer stations, they operate under the authority of the FCC rules, Part 15.217 which permits license-free operation of a transmitter from 160 to 190 kHz (1750 meters) under the restrictions listed below. (Similar rules exist in Canada – see RSS-210 regulations):

- Total input power to the final RF stage must not exceed one watt.
- Total length of the transmission line, antenna, and ground lead (if used) must not exceed 15 meters (49.21 feet).
- All emissions below 160 kHz and above 190 kHz must be suppressed at least 20 decibels below the level of the fundamental carrier.

Although these restrictions may sound harsh, Lowfers are getting out surprisingly well in many cases, with contacts of over 300 miles becoming almost commonplace. Table 2 lists stations believed to be active at this writing. This information comes from the Long Wave Club of America (LWCA), publishers of the *Lowdown* journal. For subscription information, check out their website at **http://www.lwca.org**, or write to club headquarters at: 45 Wildflower Road, Levittown, PA 19057-3209.

Until a few years ago, most Lowfer stations ran standard keyed-carrier CW, but today a number of new digital modes have appeared. Among them are QRSS (super-slow CW), BPSK, and WOLF – all of which require a computer (with a soundcard) and the appropriate software to properly view. Having said this, many stations still run standard CW at least part of the time. (AM and SSB voice are heard to a much lesser extent.) For more information on Lowfer modes, including some links to free decoding software, check out the LWCA's website mentioned above.

While tuning down here, you may also want to check out 136 kHz +/- from time to time. A number of experimental stations are becoming active here, and they are using higher power than is allowed on the traditional Part 15 Lowfer band.

TABLE 2. LOWFER LISTINGS – WINTER 2005-06

FREQ.	ID	CITY
164.900	KLFB	Sunnyvale, CA
166.500	XSR	Jefferson, LA
171.842	HS	Monroe, CT
173.750	BCY	Bucyrus, OH
175.000	D	Des Moines, IA
175.800	BA	Lancaster, IL
176.200	2J	East Windsor, NJ
181.167	IZJ	San Gabriel, CA
182.200	BRO	Duluth, MN
183.300	PLI	Burbank, CA
183.544	MEL	San Jose, CA
183.673	NW	Williams, OR
184.325	WMG	Pittsburg, KS
184.600	JJX	Garden City, NY
184.700	GNB	Hagerman, NM
184.800	BK	Shell Lake, WI
184.900	7JE	Waddell, AZ
185.185	FAW	Riverton, UT
185.297	COV	S. Coffeyville, OK
185.297	TAG	Raymond, ME
185.298	IP	Agricola, MS
185.299	NC	Stanfield, NC
185.300	MO	Seneca, MO
185.300	WM	Andover, MA
185.301	TMO	Richmondville, NY
185.301	VD	Burlington, CT
185.302	UWL	Sapulpa, OK
185.303	WD2XGI	St Francis, MN
186.410	HCN	Magdalena, NM
186.450	JWS	Kernersville, NC
186.700	LEK	Aitkin, MN
186.940	BOB	Mahomet, IL
187.752	NHVT	Charlestown, NH
188.100	YHO	Mason, OH
189.390	TH	Colts Neck, NJ
189.659	NWNJ	Hainesville, NJ
189.800	RM	Duluth, MN
189.950	WEB	Rosenberg, TX

❖ Winterfest

Also in the "things to do" department is the **Winter SWL Festival**, coming up March 3-4 in Kulpsville, PA. The 2006 Festival is organized by Richard Cuff and *MT*'s own John Figliozzi. 2006 marks the 19th year for this successful event which is known for having something for just about everyone – from VLF through UHF.

As usual, the SWL Festival will be held at the Lansdale-Kulpsville Holiday Inn, 1750 Sumneytown Pike, Kulpsville, PA 19443 (Tel. 215-368-3800). More information and a map can be found on the fest's website at **http://www. swlfest.com.**

See you next month!

Beacon RYV (371 kHz) Watertown WI. Photo by Tom Wrensch.

Pirate Activity Still High

Despite the demise of *The ACE* bulletin of the now dormant Association of Clandestine radio Enthusiasts after an innovative 20 year run, North American pirate activity continues at a fairly high level. *Monitoring Times* readers logged more than two dozen stations this month. The area around 6925 kHz remains active with pirate signals, even as DXers search for a new venue to find logging information on the stations. Once again, one such venue is this column.

❖ Schoech's QSL List

Martin Schoech from *Clandestine Radio Watch* has announced a new pirate radio address information service. He says that he has a list of 3,000 shortwave and medium wave pirates from both Europe and North America. Portions of his information are available on the internet at the **http://www.schoechi.de/pwdb.html** URL. But, he also provides a comprehensive list including addresses of pirate stations that have been active between 1994 and 2005. Access to the huge historical list is available from Martin for a nominal fee of $6 US or 5 Euros. If you would like additional information on these monthly updates, send an e-mail to Martin at his *radio2005@schoechi.de* e-mail address. Given the demise of *The ACE,* there may be more interest in the DX community in Martin's new service.

❖ Black Arrow Radio

Even though they only use a 20 watt transmitter, several North American DXers have reported hearing European pirate **Black Arrow Radio** from the Netherlands on frequencies such as 15080 kHz. If you hear this one, they are QSLing via PO Box 128, 9410 AC Beilen, Holland. As we see here this month from Chris Lobdell, they have a nice verification sheet.

❖ West Africa Democracy Radio

Numerous DXers have reported hearing the new semi-clandestine station **West Africa Democracy Radio**. They began operating in mid-November on 12000 kHz with a two hour program at 0700 UTC. The first hour is in English, a rare thing in clandestine radio, with the second hour in French. If you have never heard a clandestine radio station, this one is a good bet to check out. Their e-mail address is *wadr@wadr.org* from studios in Dakar, Senegal. By the time you read this they hope to have another broadcast active from 0900-1100 UTC on 17860 kHz.

❖ Providence Maildrop Closes

Some DXers got a rude shock when their reports to the longtime pirate maildrop at PO Box 28413, Providence, RI 02908 were returned to sender by the post office. According to Martin Schoech of *Clandestine Radio Watch* and veteran pirate DXer John T. Arthur, some of the old Providence stations are now using the Belfast maildrop for reception reports. You can try sending Providence reception reports to Belfast (see addresses below), but this method may not always work, as others are using Merlin in Ontario. Stay tuned for further developments in this breaking story.

❖ What We Are Hearing

Monitoring Times readers heard plenty of North American pirates this month. You can hear them too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays such as President's Day, Valentines Day, and even Groundhog Day. You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but the primary North American pirate frequency of **6925 kHz**, plus or minus 30 or 40 kHz remains the best place to scan for the pirates. More than 95% of all North American shortwave pirate broadcasts are heard on or near 6925 kHz.

Captain Morgan- If you hear Twilight Zone music or other TV audio mixed with rock and roll tunes, you probably are hearing this one. (None, says to send loggings to the Free Radio Network web site, and has QSLed lately)

Channel Z Radio- Like most pirates, this one normally features rock music. But, their format can vary, so pay attention as you try to identify them. (Uses *channelzradio@gmail.com* e-mail)

Grasscutter Radio- They have expanded their focus. Sometimes they transmit rock music, but at other times they relay shows produced by other pirates. (Uses *grasscutterradio@yahoo.com* e-mail)

Ground Zero Radio- Dave Gunn's rock music supposedly is transmitted from an abandoned ICBM missile site. (Elkhorn)

KIPM- Alan Maxwell's existential drama shows are one of the only true drama shows on radio today, either on shortwave, FM, or medium wave. (Elkhorn)

Old Turkey Radio- This old timer often resurfaces around the holidays, with humor about turkeys and parodies of family hoidays. (Announces *oldturkeyradio@yahoo.com* e-mail)

Partial India Radio- Unlike **All India Radio** in India, this station emphasizes pirate radio humor. (Belfast)

Pirate Cat Radio- Larry Boswell sent in a log of this FM pirate on 87.9 MHz in San Francisco back in April, but the post office took eight months to deliver Larry's mail to MT. Sorry about the delay, Larry. The format of the station is drama shows and miscellaneous music. (None)

Radio Bingo- In the radio version of bingo, the winner of the prizes is always John T. Arthur. This one has returned, sometimes with other IDs such as **Radio Corbaine**. (None)

Radio Free Euphoria- Captain Ganja remains the foremost advocate for marijuana use on the radio. (Belfast)

Radio Free Whatever- Their rock music is said to come from "the right coast." (None known yet)

Radio Moshiach and Redemption- Sometimes inaccurately called Lubavitcher Radio, this orthodox Jewish advocacy station on 1710 kHz above the medium wave X Band airs programming similar to their internet service on the *http://www.radiomoshiach.org/* web site. (Brooklyn and uses *radiomoshiach@erols.com* e-mail)

Take it Easy Radio-Their programming varies from relays of historic radio features to regular rock music fare. Their theme song by the Eagles is usually played at sign-off. (Merlin)

The Crystal Ship- The Poet's rock music and left wing political commentary is heard on various unusual frequencies, such as 1710, 3320, 6854, 6875, 6925, and 9057 kHz. (Belfast and uses *tcsshortwave@yahoo.com* e-mail)

Undercover Radio- Dr. Benway transmits rock music "from the middle of nowhere." (Merlin and uses *undercoverradio@mail.com* e-mail)

Voice of Captain Ron Shortwave- The captain has been supplementing his rock music with historical discussions of pirate radio. (Uses *captainronswr@yahoo.com* e-mail)

Voice of Laryngitis- Genghis and Stanley Huxley have returned with one of the best produced pirate comedy productions in history. This station is a pirate radio legend. (Belfast)

Voice of the Cat- This one is rarely heard, but when it is on, it has a reggae music format. (Providence but see above)

Voice of the Runaway Maharishi- Sometimes Captain Ganja sweeps aside his normal IDs and he becomes Maharishi Ali Ganja. (Belfast)

WDVL- The Voice of the Prince of Darkness tells the story of Damon Rector, a deceased ham radio operator who came back as Satan to haunt pirate radio. (Uses *wdvlsw@netscape.net* e-mail)

WEKG- This new one programs rock music. Their interval signal is the beeping noise from a medical EKG machine. At sign-off, the EKG beeps stop, as the program dies. (Uses *wekgradio@yahoo.com* e-mail)

WHGW- Mike transmits a variety of formats including eclectic rock music, dramas, and even rare non-voice digital transmissions. (Uses *whgw@yahoo.com* e-mail)

WHYP- James Brownyard once operated a small local licensed MW station in North East, PA. This pirate's comedy, rock music, and ancient Lake Erie weather reports are a memorial takeoff on the medium wave station. (Belfast and uses *whypradio@gmail.*

ON THE HAM BANDS

THE FUNDAMENTALS OF AMATEUR RADIO

T.J. "Skip" Arey, N2EI
tjarey@monitoringtimes.com

February Tangentials

February is a bit of a down month for me in the idea department. I'm usually operating a lot (check out this month's Contest Corner!), taking advantage of the better winter atmospherics; I also have a project or two on the workbench; and then there is preparation for my annual trek to the Kulpsville Winter SWLfest (March 3-4 **http://www.swlfest.com/**) . But there is still a lot to talk about in the Ham Radio world. I just have to wrap my mind around a few ideas that have come up, mostly from readers like yourself. Hang on, folks, I'm going to go all tangential on you again.

❖ Political Power

In the December 2005 issue of *MT,* I waxed philosophic about the use of scanners by amateur radio operators. A few states do restrict scanner use in some ways but, with the notable exception of the District of Columbia, those that do restrict scanner use, particularly in mobile operations, make reasonable exceptions for licensed amateur radio operators.

That being said, several folks contacted me to ask about how they might go about changing the law. The answer can be found in taking advantage of two things hams have in going for them – their tenacity and their ability to work together in an organized way. For example, here in the State of New Jersey, we had a scanner ban in place going back almost to the days of Marconi. In fact, it was generally known as the "Shortwave Law," because it was on the books back in the days when police and fire folks used the HF bands to do their business. For many years, hams individually and in clubs worked unceasingly to lobby their state officials. Meetings were held and support was garnered wherever a friendly ear could be found.

While this counted for a lot, I also believe that the history in our state of hams being involved in public service activities as adjuncts to the police, fire, and EMS at such things as parades and other public gatherings served to show that hams were responsible citizens with the community's best interests at heart. It took a long time, but then, in the early 1990s, the law was finally changed, not just for hams, but for everyone in our state. So it can be done.

If you are in a state with restrictions or if you're bound by local ordinances, get to your nearest ham club and get the ball rolling. You will be doing a great service for the entire community.

❖ Antenna Antics

In that same article about scanning, I talked a bit about the antennas I use for scanning and VHF/UHF ham operation. Whenever I mention antennas,

I always get a few e-mails or letters asking what I use for my forays onto the lower end of 40 meters – my HF antenna setup. Now, I am sure my stature and success in the ham radio community has many folks convinced that I have a couple of tall towers with monster monobanders mounted at 60 and 120 feet. Yeah...right!

Allow me to let the wind out of that particular balloon. I have never owned a rotating directional antenna in my entire amateur radio career! I seem to recall my parents had a TV antenna that rotated, but my radio activities have always been done with simple wires. In my early ham radio career this was done because of lack of funds and various restrictions put upon me, first by my family and then by living location. (PRB1 was but a gleam in the ham community eye back then.)

Now I use wires because I simply enjoy the challenge of making them work for me. Oh, yeah…*and* I'm cheap.

My antenna of choice over the years, with some experimentation, has been more often than not an 80 meter dipole fed with 400 ohm ladder line (or TV twin lead). This would be run to a balanced line antenna tuner to work on all bands 80 and above. More recently I terminate the ladder line outside of the entrance into the shack with a 4:1 balun and then bring a short run of coax into the shack and the tuner. Again, it loads everywhere with little fuss or muss. Outside the house it is a very clean installation. Many folks in my neighborhood do not even know that I am a ham. With simple antennas such as this I have filled my walls with awards and certificates. I've even won my class in a few contests.

The other advantage of wire antennas is that it is easy (and cheap) to experiment. I've been reading a lot about off center fed dipoles lately and, once the ice melts enough to get back on the roof, I may throw one or two up and see how they fare against my traditional "one size fits all" dipole.

❖ EQSL.org

Folks write me all the time about the QSL process. Everyone in ham radio knows that, in addition to playing radio, you get to play with the post office. Actually, you get to experience the various postal systems, their intricacies and their quirks, around the world. When you realize that minimum air postage runs between 60 and 80 cents each way, DXCC confirmation is going to cost you well over $100 unless you are willing to wait the several years, in some cases, for your cards to all clear the QSL Bureau.

A number of notable experiments are under way to take the post office out of the equation and

make verification of contacts a true, ham to ham, experience. I came upon **http://www.eqsl.org** almost by accident. I received an email from a ham (and *MT* reader) in Ohio informing me that I had an EQSL card from him on this server. When I webbed over to eqsl.org for a look, I discovered that I had something on the order of 60 contacts listed, including several DX countries I was waiting patiently by the mailbox for. The interface is friendly, and dozens of organizations accept EQSLs sent through this service toward their awards. (Note: At this time eqsl.com confirmations are not accepted for ARRL awards. These require use of the ARRL approved *Logbook of the World* system.)

Since first hearing of the eqsl.org site I have received and sent dozens of EQSLs and can report perfect authenticity and rapid response. I expect that the electronic QSL process will continue to refine itself to the point that we can all save a lot of money that would otherwise go to the postal system and not the hobby. There is no charge for basic service on this site, but additional services are made available for donations.

❖ So what is this Logbook of the World thing?

The process to confirm electronically for ARRL awards is a bit different. It is not so much a QSL exchange system as it is a system by which you place your log information into a repository that is secured by a digital signature process. Once you are registered in the system, you can upload your logs for verification and confirmation against millions of other hams' efforts. The process to upload the logs is similar to the way hams currently upload their logs for contest credit.

Obviously, as more and more hams join up with Logbook of the World, more accuracy and a higher confirmation rate will result for its users. There is no charge for basic confirmation services, but if you want to use your confirmations for Award Credit, there is a fee assessed of 25 cents per "card." I use card in quotes, because no actual cards are issued by this system. You can learn more about the Logbook of the World at **http://www.arrl. org/lotw/#about**

While I am excited about the efforts to ease our postal burdens in the pursuit of our radio hobby that the various EQSLing systems provide, I still

like to hunker down on a cold winter's night and enjoy my scrapbooks full of cards from around the world. I guess that makes me "Old School."

❖ GUD WID BURO OM

While we are on the subject, and while we are waiting for EQSLing to fully mature, the Incoming and Outgoing DX Bureaus are still the least expensive game in town for getting actual paper QSL cards moved around the world. If you are not familiar with the QSL Bureau process, a good place to start looking into things is at **http://www.arrl. org/qsl/qsl-faq.html** For the cost of as little as $4.00 for half a pound of cards (usually about 75 cards), you have theoretically reduced the cost of confirming DXCC from over $100 dollars to less than $10. For the latest information on the Outgoing Bureau check **http://www.arrl.org/qsl/qslout.html**.

But remember, there are two sides to this process. There is the Outgoing Bureau to send your cards out through the services of the ARRL, but there is also the need to establish your presence with the Incoming Bureau for your call area. These Bureaus are staffed by volunteers and in order to operate efficiently, they have some very clear expectations for you to follow if you want to get your cards through them. Minimally, most Incoming Bureaus ask that you send a 5 x 7-1/2 or 6 x 9 inch self-addressed, stamped envelope (SASE). Neatly print your call-sign in the upper left corner of the envelope. Place your mailing address on the front of the envelope. A more common practice used by many Bureaus now is to sell postage credits that are applied to your account and then the Bureau provides the envelope and postage. For the latest information on the Incoming Bureau check **http:// www.arrl.org/qsl/qslin.html**

But remember, while the Bureau is cheap, the Bureau can also be slow. My personal record for waiting for a card is a bit over 4 years. I know of a few that have taken longer. Also, a small number of countries do not participate in the bureau system or only process cards for hams that are members of their particular national ham organization.

❖ Look Ma, No Hands

Let me toss out something that has been running through my brain for quite a while. I don't have the time or talent to develop the idea, but, if you run with it and make some money at it, you could send me a nice new transceiver as a thank you gift.

My state, like many others, has passed a law prohibiting using handheld cell phones while driving. These laws have brought about a number of "hands free" technologies that allow folks to still gab away on their phones while keeping their hands planted firmly at ten and two-clock on their steering wheel.

Now, as someone who has wrapped their mike cable around his steering wheel more than a few times, I am really surprised someone hasn't come forward with a viable "hands free" system for mobile hams. Anybody who figures out how to make a "Bluetooth" headset work with my Yaesu is going to get my business! Remember, you heard it here first.

Well, thanks for putting up with me this month. Lots of loose ends, but I am sure I've stirred the pot a little as well. I'm heading back down to the bottom of 40 meters. Have fun.

com e-mail)
WMPR- The "dance party" techno rock pirate is still widely heard by pirate DXers with a "micropower radio" slogan. (None, has QSLed only at the Winter SWL Festival)
WRQK relay- Some pirate has been relaying Wolfman Jack shows from WRQK-1090 in Los Angeles. The shows are in the border radio style, with apparently intentional confusion between W, K, and X call letters. (None)
WSVR- This odd station has only given IDs in Morse Code, and only on some programs. Their slogan is "radio is my friend; my friend is radio." Drama shows tell the tale of the Cherokee mental asylum in Iowa. Some DXers are calling this one **Cherokee Asylum Radio**. (Try their *Cherokeemental@yahoo. com* e-mail address, which has been announced)

❖ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations, especially in Europe where the value of the US dollar is plunging rapidly. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 69, Elkhorn, NE 68022; 383 Kingston Avenue, Suite 94, Brooklyn NY 11213; and PO Box 293, Merlin, Ontario N0P 1W0.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletin for submitting pirate loggings with a hope that pirates might QSL is now the e-mailed Free Radio Weekly newsletter, still free to contributors via *niel@ican.net*. A few pirates will sometimes QSL reports left on the Free Radio Network web site, at **http://www.frn.net** on the internet. Unfortunately, given the demise of *The ACE*, that widely read bulletin can no longer be used in order to notify pirates that a listener heard a broadcast.

❖ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors: John T. Arthur, Belfast, NY; Kirk Baxter, North Canton, OH; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; Ralph Brandi, Middletown, NJ; Ray Bauernhuber, Whitestone, NY; Larry Boswel, San Francisco, CA; Wendel Craighead, Prairie Village, KS; Rich D'Angelo, Wyomissing, PA; Gerry Dexter, Lake Geneva, WI; Harold Frodge, Midland, MI; William T. Hassig, Mt. Prospect, IL; Stanley Huxley, Belfast, NY; Harald Kuhl, Germany; Terry Kreuger, Clearwater, FL; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; Larry Magne, Penn's Park, PA; John Poet, Belfast, NY; Lee Reynolds, Lempster, NH; Martin Schoech, Eisenach, Germany; John Sedlacek, Omaha, NE; Lee Silvi, Mentor, OH; Bob Wilkner, Pompano Beach, FL; Niel Wolfish, Toronto, Ontario; and Joe Wood, Greenback, TN.

Antenna Farm in a Suitcase: Part One

It could be quite a learning experience to be able to own several different kinds of antennas and to see how they perform in comparison to each other. Ordinarily, making several antennas would be expensive and time consuming. However, there is a technique called "antenna modeling" which takes advantage of the fact that, for any one antenna design, performance in terms of gain, directivity patterns, polarization, and feed-point impedance is the same on any one band as it is on any other band.

The size of most antennas is directly related to the size of the wavelength on which the antenna is to operate. So the advantage to antenna modeling is that you can build an antenna for operation on the UHF band where wavelengths are relatively short, and its performance will give you a good idea of how that antenna design would work for you on a lower-frequency band. For instance, at 500 MHz a half-wavelength dipole would be less than a foot long. That would be relatively easy to handle for testing as compared to, say, a half-wavelength dipole for 10 MHz that would be about 47 feet long.

You'll need a source of a stable UHF signal in order to compare the performance of your different antennas. UHF TV stations are a good

choice as they are usually on the air continuously many hours each day. And it is relatively easy to detect improved antenna performance by noting the quality of the received picture. Or, if you have a signal-strength meter on the receiver you use, then any kind of UHF signal should be OK. You won't have to test the antennas by transmitting with them, because the principle of antenna reciprocity tells us that their gain, directive patterns, and so forth will be the same for transmitting as they are for receiving.

❖ So Let's Model Some Antennas

Note that these instructions are for antennas to be used in temporary situations. They can be put together with epoxy glue or small nuts and bolts. At times I've used string, rubber bands, or contact cement to hold the pieces in place. If you want to use any of these models as a more-permanent, or outdoor antenna, then any wood used should have a couple of coats of varnish, the feed line should be sealed with some kind of coax sealant, and all connections should be soldered.

Let's start with a half-wavelength dipole (fig. 1A). Find its length in inches for the frequency you

choose by dividing 5616 by the antenna's operating frequency in MHz. (For length in centimeters, substitute 14264 for the 5616.) Since we want to use the antenna at 500 MHz, then the dipole length would be: 5616/500, or about 11.2 inches long. This element must be cut at its middle, and the coax feed line attached there (inset fig. 1A). Connect the center conductor of the coax feed line to either element, and the shield to the other element.

Use a few feet of 50-ohm coax as your feed line for all these antennas. Of course, this won't provide a really good impedance match for the antennas. But use only a few feet of good-quality cable, and you will get results that will be informative and useful even if not precise. I find that my models give the expected comparative performance when using the techniques I outline here. The center insulator of the dipole can be of plastic, dry wood, or almost any non-conducting material. Coat-hanger wire, heavy copper wire, or aluminum ground wire can be used for the elements. A handle or a stand, also made of non-conducting material, will be handy for your tests.

For the quarter-wavelength ground-plane antenna (fig. 1B) each element is just half the length given by the half-wavelength dipole's length formula. Connect the elements to an insulating base

A
ELEMENT
CENTER INSULATOR
COAX

B
ELEMENT
INSULATOR
BASE
COAX
RADIAL
COAX

C
LENGTHS (feet)
REFLECTOR: 491/FREQ(MHz)
DRIVEN ELE: 468/FREQ(MHz)
DIRECTOR: 445/FREQ(MHz)
SPACING: 98.4/FREQ(MHz)

LENGTHS (meters)
REFLECTOR: 150/FREQ(MHz)
DRIVEN: 143/FREQ(MHz)
DIRECTOR: 136/FREQ(MHz)
SPACING: 30/FREQ(MHz)

DIRECTOR
BOOM
DRIVEN ELEMENT
REFLECTOR
CENTER INSULATOR

D
LENGTHS (feet)
REF: 444.6/FREQ(MHz)
DR: 425.9/FREQ(MHz)
DIR: 410.9/FREQ(MHz)
SPACE: 280.8/FREQ(MHz)

LENGTHS (meters)
REF: 135.5/FREQ(MHz)
DR: 129.8/FREQ(MHz)
DIR: 125.2/FREQ(MHz)
SPACE: 85.59/FREQ(MHz)

DIRECTORS
BOOM
DRIVEN ELEMENT
CENTER INSULATOR
REFLECTOR

Fig. 1. A half-wavelength dipole antenna (A), a quarter-wavelength ground-plane antenna (B), a 3-element Yagi-Uda beam (C), and a 7-element Yagi-Uda beam (D).

such as a block of wood, or a plastic wine cork (inset fig. 1B). The vertical element extends completely through the base, and the radials can simply be glued into shallow holes in the side of the base. Only two radials are needed. Then attach the feed line as shown.

Two different Yagi-Uda beams are shown (fig. 1C & 1D). The elements can be glued or tied to a wooden or plastic boom, or holes can be drilled in the boom and the elements glued into the holes. Dimension formulas for the elements, and for element spacing are shown in fig. 1. Make the center insulator for the active elements on these beams as you did the dipole above.

❖ Checking Antenna Performance

Tune in a signal on your receiver, move and rotate the antenna. Watch the quality of the TV picture as an indicator of how much signal strength an antenna captures: the better the picture quality the better the antenna is performing. Choose a weak signal to monitor so that you can easily tell when picture quality fades or improves. For best results, the coax of the dipole and ground-plane antennas should lead away from the antennas at the angles shown in fig. 1. For the beams, lead the coax away from the antenna at a right angle to the driven element as for the dipole.

As you'd expect, the ground-plane antenna should show you a non-directional horizontal radiation pattern. In contrast, as you rotate the dipole, you should find nulls (low response) when the ends of the antenna point towards the transmitting antenna. Keep in mind that nearby objects affect the antenna's patterns. Inside a building it is sometimes difficult to observe an antenna's directional properties, due to reflections from the various objects and wiring in the building. It's best to check antenna performance outside, away from buildings and other things that might interfere with signals.

The horizontal directivity of the three-element Yagi-Uda will be rather broad. You will see a much sharper directivity in the seven-element model.

If you'd like to try other antenna designs which use 1/2 or 1/4 wavelength elements, you can use the formulas as given above to find element lengths.

❖ Next Month

Next month we'll discuss more on how to use these models, their radiation patterns, and why we can't access vertical directivity reliably with this simple setup.

RADIO RIDDLES

Last Month:

Last month's riddle was: "I mentioned signals propagating a bit beyond the horizon. Wouldn't they have to bend to do that? And, no, they aren't reflecting as skip signals do. Text books tell us that radio waves travel in straight lines. What's going on here?"

Well, signals do act like they are bending at times. In fact, the horizon which radio waves "see" from an antenna is somewhat farther out than our visual, line-of-sight horizon. This occurs due to refraction of radio waves in the lower portion of the atmosphere, just as a prism refracts light waves.

A phenomenon called the "knife-edge phenomenon" can also change the course of radio waves, and allow them to propagate far beyond the horizon. It seems that electromagnetic waves, when passing over a sharp-edged object, are diffracted downward a bit. Just what constitutes a "sharp edged object" depends on the size of the wavelength involved. For deflecting light waves, the edge must be sharp indeed. For radio waves, which are much longer than light waves, the edge needn't be so sharp. Even a hilltop can do the job. And for very-low frequency radio waves even the curvature of the earth itself is sufficiently sharp to cause the deflection!

This Month:

Are there other kinds of antenna modeling than the one that we discussed above?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

HQ120 Restoration and Receiver Evolution

By now, I had expected that the Hammarlund HQ120, subject of our latest restoration project, would be working – or at least showing definite signs of life. Actually I did accomplish the latter, but only for a few brief minutes!

When we left off last month, I had just discovered that there was a high resistance short to ground in the B plus line connected to the output of the power supply's second filter choke. You might think that a B plus short would be quite an easy thing to find, especially since I had already changed out all of the paper capacitors – which are the usual culprits.

Not so in the HQ-120, however. The wiring is quite dense and much of it is tightly cabled. Occasionally it dives into a subassembly (such as the BFO or crystal filter) that is mounted above the chassis. There's no way to get inside those without, at the least, removing the cabinet. In the case of the BFO can, which has no access plate, the wiring would have to be disconnected from below (a daunting task indeed considering the crowding). Then the subassembly would have to be dismounted and removed from the radio.

A Clue at Last

I pondered the situation for quite awhile, but I was stumped until I discovered that the short disappeared in the "AVC" position of the receiving mode switch, but was present in the "Manual" and "CW" modes. Take a look at the schematic of that switch (marked "101"), focusing on the top group of three contacts. You'll see that the switch grounds a certain line in "Manual" and "CW" but not in "AVC." This gave me the clue I needed.

Someplace in the receiver, the grounding effect of the mode switch was allowing a defective circuit or component to create that high-resistance ground in the B Plus line. If I could identify the "ground" line coming from

The receiving mode switch (labeled 101 on the schematic) gave me my first clue in locating a stubborn short (see text).

the mode switch and remove it from the radio circuitry, one connection at a time, I might be able to find a place where a disconnect makes the short disappear.

With the help of the schematic, I was able to locate the line, or bus, just before it entered the first i.f. transformer. As it happens, that location looked like the end of the line. I disconnected it there (with no effect), and then began following it back towards the switch. Although the wire was tightly cabled, I was able to identify and follow it through its color code.

My luck was no better with the second disconnect, but I struck paydirt with the third! The B plus short no longer appeared at any position of the mode switch. And I spotted the problem almost immediately. It had been caused by my own carelessness.

Just below that disconnect point was a spot where I had shoehorned three replacement caps behind a group of four resistors that were supported between two terminal strips. I had no sooner glanced at it when my eye was drawn to the place where leads that shouldn't have been touching were touching. Repositioning the leads solved the problem.

Testing Again

Elated, I replaced all of the connections and turned on the receiver for another test. As always, I hooked up a meter to monitor B plus – just in case another short appeared. However, it remained steady on full voltage and the #2 power supply choke was no longer heating up, making "cooking" noises, or emitting wisps of smoke.

After a brief warm-up period, the set began to show signs of life. I heard no stations, not even on the broadcast band, but there was static as I moved the bandswitch and other controls and when I brushed an antenna terminal with a screwdriver. A good sign! But here is where Murphy raised his ugly head once more.

I shut off the radio for a short time so that I could set up to continue the signal tracing session, begun some time ago, that had ended abruptly when the choke began to smolder. When I got everything ready to go and turned on the set once more, those encouraging signs of life were gone!

I heard a tone in the speaker when I connected my audio generator to the grid of the final audio stage, but the tone disappeared when I moved back to the grid of the first audio stage. This is essentially where I had
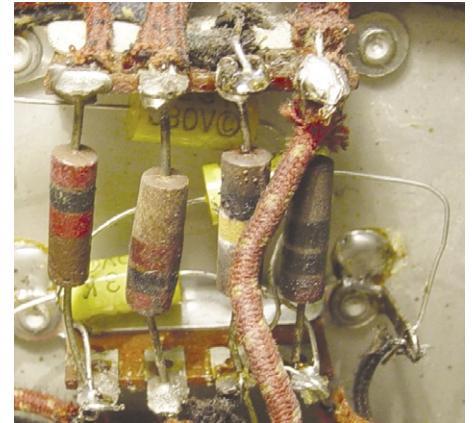
The short turned out to be of my own doing, accidentally created when I wired three replacement capacitors behind this group of four resistors.

ended up last time, the only difference being (thankfully) that the choke was no longer being traumatized. Checking voltages, I found that the plate of the first audio tube was 30% low (compare with 60 % last time).

This voltage is supplied via power supply choke #2, so I immediately suspected that the choke had been damaged by the overloads suffered earlier. Disconnecting it, I found it was not shorted to ground. Then I checked its resistance against the same choke from my parts set. It was 800 ohms compared with the parts set unit's 700. Not a significant difference I suppose. But I was mildly surprised at the high resistance of both chokes. I would have expected something in the neighborhood of 100.

That's where I ended this month's session. As long as the choke is already disconnected, I'll swap it for the one in the parts set before continuing the tests. All that smoldering and overheating couldn't have done it any good!

By the way, working on a set this size and weight is quite a different experience from the smaller communications receivers I've dealt with up to now. It crowds out the instruments and tools on the bench and is awkward to move. I have an old dish towel under the set – which makes it easier to swivel around on the bench top and avoids scratching the cabinet.

Since this set has several tubes with grid caps, the problem is exacerbated. One really needs to have the radio flat on its back for ease in circuit tracing, but at other times it has to
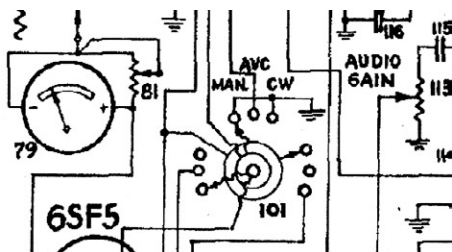
The Model 60, RCA's first plug-in superheterodyne, had a coffin-shaped cabinet reminiscent of the early "three-dialers."

be up on a side to give access to control grids for signal tracing. It can be quite a workout!

❖ Radio Evolution Continued

Last month we left off with the introduction of the first a.c. sets, using an Atwater Kent TRF (tuned radio frequency) radio as an example. The next stage of radio development was the introduction of the superheterodyne circuit which, like the powerful regenerative circuit, had been invented by famed radio genius Edwin Armstrong.

The superheterodyne eliminated the major problem with the TRF circuit – which was that all r.f. amplification stages had to be tuned to the frequency being received. In the earliest sets – the battery "three-dialers" – three knobs had to be readjusted and peaked each time the receiving frequency was changed. In later "single control" sets, where the tuning capacitors were ganged, various circuitry tricks had to be employed to keep all circuits "tracking," at least approximately, as the radio was tuned across the band.

The power of the superheterodyne lies in the fact that only one tuned circuit is varied to select the frequency to be received. All received frequencies are automatically converted into a constant "intermediate frequency," or i.f., (usually 455 kHz). So, all stages of subsequent amplification can be optimized and fixed-tuned to the i.f. This

The much-beloved "cathedral" shape was created when the sides of the cabinet curved inward to form an arch over the loudspeaker.

obviously eliminated most of the "tracking" problems and enabled the design of much more sensitive receivers.

RCA controlled the patents to this circuit, as it did to the regenerative receiver. Although licenses to other manufacturers were issued and the "superhet" circuit eventually came to be used in virtually all receivers, the TRF circuit hung on for quite awhile. What kept it going was the introduction of the screen grid tube about 1929.

These four-element, or "tetrode," tubes, such as the familiar type 24-A, enabled much more powerful r.f. amplification than the three-element triodes. The extra amplification tended to minimize any losses of sensitivity due to imperfect tracking.

The Ugly Duckling Grows Up

Now let's take a quick look at the physical evolution of radio receivers, beginning with RCA's first plug-in superheterodyne, the Model 60, introduced in 1929. This model was packaged much like an early three-dialer battery set, with all of its stages arranged in a straight line. Its long, coffin-shaped box was very much out of the battery set era. However, the handsome, highly polished woods used in the cabinet – particularly the front panel – made an elegant appearance that was a far cry from the early Bakelite-panel three-dialers.

By the early 1930s, millions of homes had a radio – and many had more than one. As the technology improved, it became possible to make sets that were smaller and lighter. Households came to appreciate the flexibility of having table models that could be moved from room to room.

But we shouldn't lose sight of the fact that this was also the era of the grand living room console. These floor-model showpieces generally contained more a powerful chassis and larger speaker than the lower-priced table models. The speaker was generally mounted *below* the chassis to help give the cabinet the additional height needed to bring the controls closer to eye level. The cabinet itself was generally crafted of fine woods or fine wood veneers. Many radio ads of the era show a prosperous upper middle class family gathered around the console to listen to a favorite program.

As radios became both compact and ubiquitous, they began to look more like household appliances than pieces of period furniture or laboratory equipment. For one thing, the components – including the power supply – were all integrated on a single chassis instead of being assembled building block style. Variable capacitors were no longer ganged by belts and pulleys, but assembled on a single shaft. The other components were grouped around the centrally located variable in a compact arrangement.

The loudspeaker lost its status as a separately-purchased radio accessory. No longer housed in a special enclosure of its own, it was moved inside the cabinet to become an integral part of the radio. Formerly driven by nothing more than an overgrown headset unit

with relatively weak permanent magnets, the speaker was now equipped with a powerful electromagnet operating from the radio's B plus power supply.

Because of this, the speaker could be now made much smaller and more compact, facilitating its move inside the cabinet. This, along with the more compact design of the radio chassis, gave the cabinet quite a different look.

Now the cabinet took on a smaller footprint, but had to become taller to accommodate the added speaker – which was generally mounted above the chassis. This gave rise to two common shapes, which collectors call "tombstone" and "cathedral." The "tombstone" shape was created when the cabinet was simply squared off at the top to form a rectangle. A "cathedral" shape resulted when the cabinet sides curved inwards to form an arch over the loudspeaker.

Cabinets now tended to be made of wood rather than the metal construction that was common during the early a.c. era. This was quite possibly because the better resonant quality of the wood improved the tone of the speaker mounted inside. The cabinets were generally left open at the back to improve ventilation.

That wraps up our evolution story for now. Next time we take it up, it will be to discuss the new minimal radio designs that evolved to meet the need for inexpensive listening during the cash-starved depression era.

Scanner Switch

By Jerry Reed

I don't know about you, but I still have every scanner I ever bought. Three generations of scanners – my Realistic PRO 2004, my PRO 2016, and my Bearcat BC895xlt – all sit on the same shelf. Admittedly, the Bearcat gets a lot more use, since it understands trunking, but I occasionally use the others to monitor specific frequencies or to scan civil or military aircraft bands. The problem is that even I find the resulting cacophony of overlapping transmissions a bit irritating, and other members of the family find it outright intolerable.

When I thought about the problem of getting maximum use out of my assorted radios, I realized that it would help if I could somehow switch a single speaker among two or more scanners. With a simple priority scheme between pairs of radios, no one need suffer through overlapping conversations, because only one scanner would be audible at a time.

It turns out that we can get most of the circuitry needed from an easily constructed kit. All that is required is to add an external relay, a case, two controls and some jacks or patch cables. In the special case of the Bearcat, which features some really neat internal switching capability, all that's

Figure 1 - How to connect the scanner switch. If your scanners feature line-level outputs, you can use the scanner switch with an inexpensive powered speaker. Otherwise use the external speaker connections. You'll have to adjust the volume controls and the VOX sensitivity control accordingly.

needed is the relay and the connectors. More about that later.

What does this set-up let you do? Here's an example of how I've been using the scanner switch. I let the Bearcat track selected talkgroups on the county system (usually detectives and fire). That's the main scanner and it stays pretty busy. But I've programmed the conventional PRO-2016 with several VHF high band frequencies of interest, including air ambulance and law enforcement intercity.

Now, whenever something comes up on the 2016 – say, the law enforcement intercity channel – it interrupts whatever is in progress on the Bearcat. Soon after the squelch closes on the effectively higher priority 2016 channel, the audio from the Bearcat resumes. This way you don't miss that plane crash while listening to local police follow some guy in a stolen car all over town.

❖ The Basics

Here's the idea – take two scanners you want to use. Let's call one the "priority" scanner and the other the "regular" scanner. The circuit is set up and the scanners interconnected so that normally the regular scanner is audible. But when the squelch on the priority scanner opens, the audio from the regular scanner is interrupted and replaced with the audio from the priority scanner. After the priority scanner squelch closes, the regular scanner audio resumes.

The regular scanner need not be a scanner at all, of course and could represent any audio stream that you would like to have interrupted with output from a priority scanner. The regular audio stream might be an amateur rig, or even radio or TV audio. I'm sure you can come up with some interesting possibilities here.

The hookup between the scanners, the switch and the speaker is shown in Figure 1.

❖ Building the Switch

Figure 2 shows the circuit diagram. The heart of the switch is a VOX kit (Ramsey #VS1). VOX, which stands for voice actuation, is normally used to key a radio transmitter or audio recorder in the presence of sound. In our case, the VOX circuit listens for audio from the priority scanner and interrupts the audio from the regular scanner whenever it triggers. By using a single pole, double throw (SPDT) relay, the VOX circuit can actually select
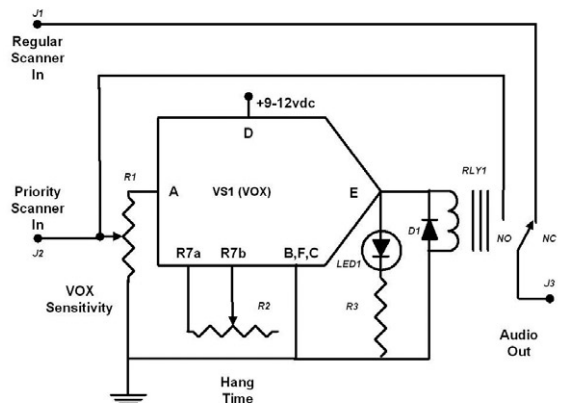
Figure 2 - Schematic for the scanner switch. VS1 is wired on its own small PC board, and all other parts are mounted on the cabinet and wired point-to-point.

which of the two audio streams will be passed, regular or priority, as it triggers.

The Ramsey VOX kit comes complete with all parts and thorough instructions, so I won't dwell on those here. If you can solder on a PC board (no tricky surface mount stuff here), then you won't have any difficulty completing the kit. Mine went together with no problems and worked right out of the box.

We need to add two basic controls. First, we

Figure 3 - Parts List

Scanner Switch (both versions)
J1, J2, J3, (J4) - RCA jack (chassis mount)
R1 - 100k ohm potentiometer
R2 - 1m ohm potentiometer
R3 - 1k resistor (1/2 watt)
D1 - 1N4001 diode or similar
LED1 - low current LED (any color)
RLY1 - SPDT relay, (Radio Shack #275-005 or equivalent)
VS1 - Ramsey VS1 VOX kit (http://www.ramseyelectronics.com)

Miscellaneous:
hookup wire, metal cabinet, knobs, 9 volt battery or 9-12 VDC AC adapter.

Notes:
- Only J1 through J4, D1, and RLY1 are needed for the Bearcat hookup.
- J4 is not used with the VS1 hookup.
- RLY1 should have a low current coil. The part specified draws 18ma. Similar relays are available from other sources (Mouser #653-G5V-1-DC9). The goal is to ensure that the amount of current drawn by the relay coil, plus the current drawn by the LED, add up to less than about 50-75ma, since the output of the VS1 is only rated for 100ma.
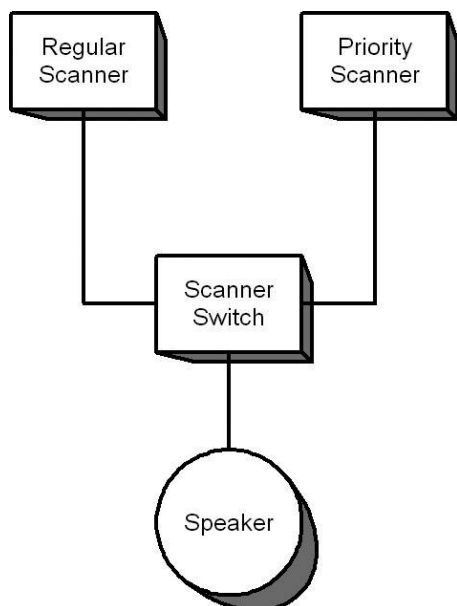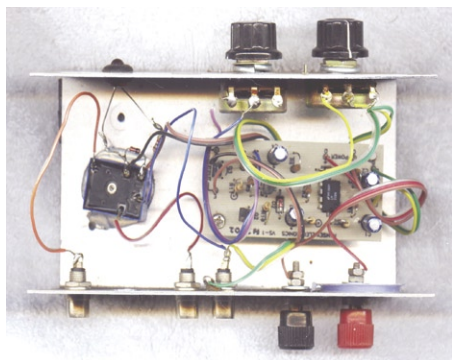
Figure 4 - Assembled scanner switch. The binding posts allow you to connect either a battery or an AC Adapter for power. RLY1 is cemented in place with Silicone RTV.

need a level (or sensitivity) control to adjust the amount of audio input from the priority scanner required to trip the VOX circuit. Second, an adjustable delay (or hang) control allows you to set how long the regular scanner audio will be interrupted after the squelch closes on the priority radio. More on these adjustments in Operation, below.

The Ramsey kit just turns on an open collector transistor when the VOX triggers, but we need to switch between two inputs. The solution is to attach a small SPDT relay to the output of the VOX kit so that when the VOX triggers, the relay closes the contact from the priority scanner audio and opens the contact from the regular scanner audio. SPDT relays with the necessary coil voltage (9 volts) are available from any number of sources, including the Radio Shack model (#275-005) I used.

Last, but not least, install RCA jacks on the housing and mount all components in a metal box. Since we may be using fairly low audio levels, a shielded enclosure is essential to reduce the possibility of 60 cycle hum creeping in. There's a jack for the priority audio in, the regular audio in, and audio out.

Optionally, add an LED (your choice of color) wired as shown in the schematic. This LED will light whenever the priority audio trips the VOX and is very useful for testing or just knowing from which source your combined audio is now issuing.

Figure 3 lists the parts you'll need, and Figure 4 shows the assembled switch in its case.
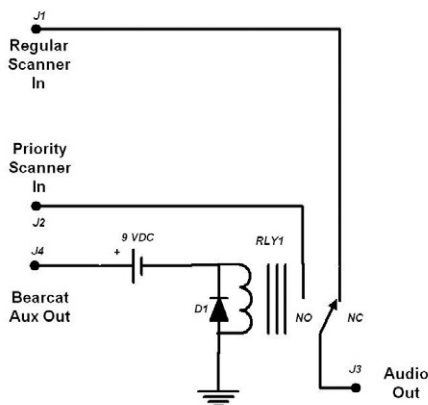
Figure 5 - Schematic for simplified Bearcat version of the scanner switch. This version doesn't need the VC1 because it uses the remote control feature of the BC895xlt.

❖ Operation

The first step is to attach the priority scanner to the priority scanner audio connector. Don't worry about the regular scanner right now; we're just trying to make sure that the VOX triggers correctly, which is easily detected from the LED or just from listening for the distinctive "click" of the relay.

The next step is to apply power. The VOX circuit may trigger immediately due to the transients that are generated when you first attach the battery or AC adapter. It should then release after a short while. If the VOX stays on all the time, you may either have a wiring error or the input sensitivity may be too high. Remove power and check your wiring. Barring any errors here, rotate the sensitivity control fully counterclockwise and reapply power.

Open the squelch on the priority scanner, turn up the sensitivity control gradually, and note at what point it triggers. Adjust the control to the point where it will reliably trigger with the priority scanner squelch open, and then close again when you close the squelch. Avoid operating with the sensitivity too high, because this will sometimes cause the electrical "click" from the relay to be picked up, re-triggering the VOX, etc. If the VOX seems to "cycle" on and off all the time, you may need to adjust the output level of the priority scanner higher, and then set the sensitivity control of the VOX correspondingly lower until the unit stops this slow-motion oscillation.

Adjust the delay potentiometer for the "hang time" you like. I like a fairly long delay (5 to 10 seconds) so that enough time is allowed for a callback on the priority scanner, but this is largely dependent on the kinds of traffic to which you listen and your personal preferences.

Now attach the regular scanner to the regular audio in jack, adjust the level on that scanner as desired, and you're ready to go.

❖ Suggestions and options

Suitable channel selection makes the scanner switch much more flexible. The switch really isn't all that useful if both the regular and the priority scanner are loaded up with active channels. That's kind of like one big scanner. This approach may have its uses, as in the case where the regular scanner can only follow trunking systems, but the priority scanner is programmed with conventional channels.

However, I've found it most useful to load the regular scanner up with very active channels, say, civil aviation approach and departure, but reserve the priority scanner for channels where activity is rare, but interesting. An example of a good set of channels for the priority scanner in my area would be military air channels. That way, with the switch running I can be assured of lots of listening from the civil aviation channels, but I know I won't miss the much more rare military air communications. I'm sure you can come up with other possibilities that best fit your listening habits.

There are a couple of big advantages this two-scanner approach has over using the priority channel feature built into the scanners themselves. First, most scanners I own only understand a single priority channel and I may want to monitor dozens of possible military aviation frequencies. Second, at least on older scanners, the processing required
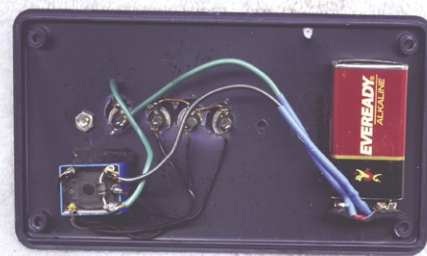
Figure 6 - Assembled Bearcat version of the scanner switch. RLY1 is in the lower left corner. From left to right, the jacks are J4, J1, J2, and J3. The 9 Volt battery is velcroed to the cabinet on the right.

to poll the priority channel is clearly audible as interruptions to the speech on other channels when the squelch is open. Think of the two-scanner approach as allowing a very large number of priority channels, with very clean interruption.

For some Bearcat owners, there's a really easy way out. For example, the BC895XLT features an "AUX" jack on the back that is designed to operate the remote control of tape recorders for unattended monitoring. With only a relay (no VOX needed; the radio does that), the BC895XLT owner can rig up a greatly simplified scanner switch as shown in Figure 5 and Figure 6.

Have more than two scanners you want to prioritize? While I haven't tried it, it should be possible to cascade two scanner switches to prioritize three scanners. The regular scanner can be interrupted by the lower priority scanner, and the lower priority scanner can, in turn, be interrupted by the higher priority scanner. A diagram of this possible hookup is shown as Figure 7. Thinking about it makes my head hurt, but it should work.

We've been discussing switching among radios, but since the VOX is attached to a relay, I suppose you could operate all sorts of indicators or alarms based on scanner activity if you like. (A half-baked idea for a loud alarm bell that warns of interesting scanning I'm missing while mowing the yard springs all too easily to mind.)

I'm hoping this article will stimulate you to come up with your own application for the scanner switching concept. Good luck with your scanning (and switching)!
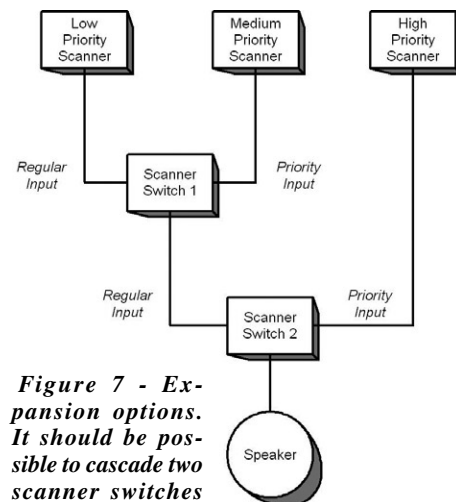
Figure 7 - Expansion options. It should be possible to cascade two scanner switches to prioritize three scanners.

MT REVIEW

Sangean WR-2 AM/FM Receiver

By Bob Grove W8JHD

Newly released from Sangean is a handsome, fine-performing, AM/FM tabletop radio with RDS (Radio Data System). For the uninitiated, RDS has been widely adopted by FM broadcasters as a means of delivering to suitably-equipped receivers (typically automotive) displayed messages like programming format, 12 or 24 hour time, title and artist of current song, road and traffic information, advertisers' phone numbers, station identification, and even station tuning information.

The WR-2 also has EON (Enhanced Other Networks), a gradually-emerging technology which allows a local broadcaster to break in on a network transmission if drivers need to be alerted to emergency road or traffic information. This new technology can even feed retuning-command information so that such a broadcast can switch an EON-equipped radio from one channel to another on which the message is being transmitted.

Following in the footsteps of its successful predecessor, the WR-1, the up-scaled WR-2 offers improvements requested by consumers of the first model. All primary functions may be operated manually or by a thin-style remote control (provided).

Weighing 5-3/4 pounds and measuring 9-1/2"W x 4-1/2"H x 7-1/4"D, the WR-2 offers a respectable 7 watts of monaural audio (10% THD) through its internal speaker. The wood housing helps keep ringing down which is often prevalent in metal-enclosed speaker systems.

For the utility of using the high-quality amplifier system with external audio sources, an auxiliary 3.5 mm mini-jack is provided on the rear panel; it accepts external, high-impedance audio inputs (47k ohms nominal) with a rated 160 mV sensitivity. Another 3.5 mm jack on the rear panel can be used with stereo headphone for private monitoring; the output is limited to 5 mW per left or right channel to avoid blasting. Yet another rear-panel jack offers an output of low-level (2.2 k ohm) monaural audio for external distribution or recording.

Encased in an all-wood cabinet and available in three different color schemes (walnut, black, or white) to match the owner's decor, the WR-2 features a large LCD display with brightness control and front-panel tuning. An additional rotary control may be alternately selected as a volume control or separately-tapered bass and treble control.

A tuned-port speaker enclosure assists bass reproduction. The PLL tuning reports its frequency to the digital display, and ten memory channels are assigned as five each

to the listener's choice of AM and FM stations. A clock/alarm can be selected as radio or buzzer.

External antenna jacks are provided for AM (screw terminals) and FM (F connector). A scan button searches through the currently-selected band (AM or FM) looking for active channels.

The radio can be powered directly from the AC line, or alternatively from a source of 12 VDC for automotive/boat/emergency use.

❖ Our Test

The handsome styling definitely lends appeal to this radio; it has a serious look to it as well as being nicely designed. Much of the operation will be intuitive, while a quick glance at the manual should familiarize the user with some of the more esoteric functions.

Audio reproduction is, of course, monaural. Sound quality is very good from the internal, tuned-port speaker. The bass/treble control allows a considerable range for custom adjustment. The double array of pushbuttons are well marked as to function, and tactile to confirm the presses.

The main tuning dial is somewhat cumbersome to use. It is too shallow to grasp, and its ring of raised spots aren't really adequate to prevent the finger from slipping as it turns the knob. Placing the hand on the top of the cabinet and pressing the thumb against the face of the knob was more effective, but the inclusion of a dimpled finger indent would have been better for slewing through the spectrum.

It is tempting to compare this radio with the well-established GE Superadio, but that

would be hard to do. The low-cost GE product is a large portable, and although it does have narrow/wide selectivity selection which the WR-2 does not, the Sangean, at more than twice the price, has digital readout and a number of other features that the GE does not.

So can the WR-2 be compared instead to the widely-promoted Bose radio? No again; the Bose costs several hundred dollars, and its concentration is on the satisfying production of FM stereo sound, in which it excels.

For those of us with a few decades of listening experience, the new WR-2 could be favorably compared to the old KLH bookshelf receivers; fond memories should flood back as we reflect on the soft bass and silky highs that emanated from those wood-enclosed receivers.

But for present-day listeners, we should consider the approximately $150 Sangean WR-2 as filling a pricing-point niche between the modest-cost, AM/FM, monaural portables and the high-cost, stereo, bookshelf receivers. In that perspective we found the new Sangean WR-2 to be a very satisfactory and attractive performer at a reasonable pricing point in the consumer radio market.

FRS or MURS? Hype or Hot Performance?

By Bob Grove W8JHD

With the wide selection of FRS (Family Radio Service) walkie-talkies available from virtually every electronics shop, mass merchandiser, and Internet electronics site, there's no question that these little radios have captured the imagination of our technical generation. It's reassuring to be able to keep in touch while caravanning, hiking in the woods, hamfesting, and other temporary separations. How does the casual consumer decide among the bewildering array?

And what about MURS (Multi-Use Radio Service)? Is there really a difference between it and FRS from a performance standpoint? After all, the advertising rates the radios by talking distance, ranging typically from two to eight or more miles.

Created Almost Equal

Is it possible that a $19.95 pair used under the same conditions as a $79.95 pair can achieve the same results? Since all FRS radios are limited by law to no more than 1/2 watt of output power and they all have at least 14 UHF channels (462/467MHz band), there must be some subtle differences that let one model beat another.

For starters, some have longer antennas (FRS antennas are permanent; you can't substitute a longer antenna!), and the most expensive of them (those with the greatest distance claims) include eight additional channels for the FCC-license-required GMRS (General Mobile Radio Service), thus offering higher power (2 watts). Many FRS/GMRS radios also have features like drop-in chargers, voice activation (VOX), calling tones, and sub-audible tone squelch to reduce co-channel interference.

But what about that other, no-license-required, service? MURS allows higher power (2 watts) on five preset VHF (150 MHz range) channels. Base/mobile and hand-held transceivers are available at very reasonable cost from communications equipment suppliers. Unlike FRS, antennas are interchangeable, permitting the connection of mobile and roof-top or tower tower-mounted base antennas for extended range.

But back to the basics: Is there an inherent advantage in using one FRS hand-held radio over another? How does FRS compare with MURS under the same conditions?

Our Units

Our choices for the test included a pair of Cherokee FR-465 FRS radios (discontinued), operating at 0.5 watts and with removable whips (disallowed by the FCC, but allowing antenna swapping); a pair of Midland G-225 FRS (claiming a 7 mile maximum range by switching from 0.5 watts FRS to 2 watts with GMRS channels); and a pair of Alinco DJ-196 2 meter held-helds at 0.8 or 4 watts with removable antennas). We used the Alincos on 148 MHz, close enough to 151.820 MURS channel 1 for a valid simulation.

As readily seen in the accompanying photo, the UHF Midland units have a short stub antenna, the UHF Cherokees have much longer antennas, and the VHF Alincos carry the longest of all. With all other factors being equal, the longer antenna means greater aperture (signal capture area). Will that make a difference?

Our Field Test

To compare the relative performances of the three radios, one was operated from inside a house while the other unit was carried through the woods in mountainous terrain. This would allow three basic parameters to be tested: operation from inside a building, attenuation from foliage, and blocking by terrain. Additionally, it was a foggy day, slightly worsening line-of-sight attenuation.

At a distance of about 1/4 mile into the woods, the Midland was solid copy, but accompanied by background hiss; the Cherokee and Alinco were noticeably stronger.

At 1/2 mile, with more intervening hills and trees, the differences were more pronounced: The Midland was erratic in performance, while the Cherokee and Alinco remained stronger and consistent. But at a mile, with even more rolling terrain, both the Midland and Cherokee were unreadable. The Midland became readable when switched to high power (2 watts), while the Alinco remained loud and clear on low power (0.8 watts).

At 1 mile away, with considerable intervening terrain and woods, only the Alinco was readable by switching to high power (4 watts). Changing antennas seemed to make very little difference in communicability between the UHF or VHF radios. It would be expected, however, that under difficult fringe-reception conditions, a longer, gain-type antenna should make a difference.

The Bottom Line

The tests seem to confirm theory – and probably many readers' suspicions: The higher the frequency, the worse the attenuation by foliage and intervening terrain; and while stub antennas may work for short distances, they degrade badly on the long haul.

If price is a necessary consideration when you're buying hand-held transceivers, select a pair of FRS transceivers with the longest antennas; next, consider the ability to switch to higher power (which requires the easily-obtainable GMRS license). If price isn't a limiting factor, buy MURS units for considerably better performance.

FIRST LOOK

CONSUMER RADIOS AND ELECTRONICS

A Fresh Look at the TenTec RX-340

By Jim Clarke, NR2G, jimclarke@monitoringtimes.com

The RX-340 is a commercially priced, all-mode DSP general-coverage HF tabletop receiver, built to deliver military-grade performance. Although reviewed by *MT* back in July 2000, this is my first look at one of TenTec's more sophisticated products.

❖ Ergonomics/Aesthetics

Some people don't like the "commercial" look, but I love it; in fact, the more a receiver looks like a piece of test-equipment, the more I am attracted to it. With that said, you'll know what I mean when I say the 340 is a beautiful radio.

With fifty separate controls, the front-panel is "busy," yet neat. Ten-Tec has segregated the controls into four logical groups: Audio, Auxiliary Parameter, Memory/Scan, and Tuning/Keypad.

The blue color of the displays and the S-meter really come together to give it a professional look. The frequency display is so visible that, with characters measuring one-quarter by one-half inch, you can read its 1 Hz resolution from across the room. Equipped with an analog S-meter, the signal strength scale is marked with two separate scales, S-units and dBm. As appealing as the blue light on the S-meter is, I found it didn't help much with reading the meter. If I were to purchase a 340, my only mod would be to change the meter illumination to white.

Turning to the rear-panel, the 340 provides a number of signal-access jacks, as well as dipswitches to configure remote-control parameters.

❖ Detection-Modes

The 340 has eight detection-modes: AM, SAM, FM, USB, LSB, ISB, CW, and CW1. Selection is made using a pair of arrow buttons immediately below its indicator.

For those not familiar with them, ISB is Independent Sideband, and CW1 is CW with no offset. In ISB, you can listen to just the upper, just the lower, or both sidebands simultaneously.

While receiving SAM, "Synchronous AM," the display uses decimal points to change "SAM" to "S.A.M." as an indication the detector has locked.

❖ Tuning/Keypad Group

The performance specifications cover 50 Hz to 30 MHz, but tuning is capable down to

0 Hz, with reduced performance, of course.

Tuning steps available are 100, 10, 9, 5, and 1 kHz; 100, 50, 10, and 1 Hz. Whenever the step size is increased, the next change in frequency rounds it to the nearest step.

The 340 is equipped with a tuning knob – not always provided on commercial radios – and, while more than utilitarian, the feel when tuning is less than that of radios half its cost. It does fit well in the hand, however, and has a finger-detent for rapid or continuous tuning. Tuning increments, while using the knob, are the same as the currently selected step size.

Up/Down buttons, on the keypad, allow the operator to change frequency as if tuning channels. The frequency change is the current step size; with the larger step sizes it's much easier to use the buttons than the knob.

Direct frequency entry is possible using the numeric keypad. Located to the left of the main tuning knob, the keys are about one-half inch square and have a nice positive feel when pressing them. However, after looking at my phone and TV remotes, I wonder if there is a reason for the top and third rows of the numeric keypad being reversed.

There is a frequency "Lock," to prevent accidental over-write, but that is all that is locked; all other front-panel controls are still usable.

❖ Memory/Scan Group

Memory operation is built on a bank of 100 memory channels, with each one holding frequency, detection-mode, and other operating parameters. Store, Recall, View, Clear, and Overwrite are all functions available for channel maintenance.

Whether using the 340 to scan memories, "MScan", or frequency ranges, "PScan," scanning behavior is customizable, allowing the user to set Dwell, Dead, and Gaze times. The amount of time the receiver stays on a frequency is determined by the Dwell setting, which can be set to 0.1 - 29 seconds, or infinite. The Dead Time setting is used to compensate for anticipated short duration losses of signal after detection. It requires a period of time from 0.1 to 29 seconds to pass, after loss of

signal, before continuing scan operations; receiving a signal during that period resets the "Dead Time" timer. "Gaze" time is how long the receiver will sit on a frequency waiting for a signal before it aborts and continues to the next.

Scanning "Lockouts" are available for discrete frequencies, as well as memory-channels. When programming a discrete "Lockout" frequency, the receiver bandwidth is also stored. By storing the bandwidth, the 340 not only avoids the discrete frequency, but also the range of frequencies from 1/2 bandwidth below to 1/2 bandwidth above center.

❖ Auxiliary Parameters Group

The Aux. Parameters group contains the following features: IF Bandwidth, BFO-offset, IF Shift, AGC, Notch-filter, Squelch, Noise Blanker, OPT1, and OPT2.

As I stated earlier, the grouping of controls gives the 340 a neat look. However, this comes at the expense of not being able to quickly change multiple settings. Just like the Memory/Scan group, there is only one knob to change the setting for all of the parameters; pressing a button within the group selects the parameter to be changed. While changing a feature's setting first requires its selection, once it's set, the same button, depending on the feature, is used to enable or disable it.

There are up to 57 predefined bandwidths available, ranging from 100 Hz to 16 kHz, depending on the detection mode.

The BFO-offset can be changed, only in CW, to +/- 8000 Hz. In CW1 the offset is fixed at 0 Hz, and in ISB the offset is fixed at 1800 Hz.

Passband Tuning, "PBT", also known as IF Shift, can be used in USB, LSB, and CW detection-modes, with shifts of +/- 2000 Hz possible.

If the typical selection of three AGC settings leaves you frustrated, you'll be pleased to know that, on top of the standard slow, medium, and fast, the 340 provides the user with a programmable AGC. The programmable AGC allows setting the attack-time from 0.01 to 1.0 mS/dB; the hang-time from 0.0 to 99.0 seconds; the decay-time from 0.01 to 99.9 dB/Sec.

The 340's notch filter leaves a little to be desired, but only compared to today's technology. The Notch is only available in CW, CW1, USB, and LSB, and can only be used with bandwidths of 4 kHz and less. Even though the Notch does an excellent job, it just can't

Table 1.

S-Unit Correlation

S-Units	Volts	dBm
0	.099 uV	-127
9	50.0 uV	-73
9 +60 dB	50.0 mV	-13

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compete with the automatic, multi-mode, multi-bandwidth, multi-signal Notches being employed on many of today's amateur transceivers.

Unlike some of the other features, the Squelch is available to all detection-modes and all bandwidths. The Squelch threshold is displayed in terms of dBm; for those not familiar with dBm, refer to Table 1 for a correlation of S-Units, volts, and dBm. Don't worry about the conversions, though; remember, the S-Meter is marked in dBm and S-Units, so you can use the S-Meter to determine the dBm level for the Squelch.

The Noise Blanker is also available for all detection-modes and bandwidths; the different blanking levels are off, or, 1 to 9.

Ten-Tec made provision for two options, OPT1 and OPT2, but at this time I know of no available options.

❖ Audio Group

The Audio group contains three controls: phones volume, speaker volume, and sideband-audio selection.

It's handy having the separate Phones and Speaker level controls. I connected the phones audio to my laptop, for data-modes, and liked being able to control the speaker level independent of the output to the sound card. Likewise, using headphones, you can switch back and forth without having to change levels based on what you're listening with.

❖ Miscellaneous Items

Input signal modification can be accomplished using either the 340's preamp or attenuator. The preamp is spec'd at 10 dB of gain, and the attenuator at 15 dB.

About that S-meter: Seeing it marked in S-Units and dBm, I just had to do a level accuracy test, see Table 2. I was impressed to find that most levels were within a few dB of the source. An aspect of the S-Meter that I really like is that it doesn't matter what AGC speed is used or whether the RF Preamp or Attenuator is active, the S-meter always indicates the actual input signal level. This may disappoint some at first, but I found it grew on me, knowing what

the signal level really is, not what I've changed it to using front-panel controls.

A rack-mount front-panel indicates the 340 is meant for more than the casual listener. Remote-control capabilities are standard, being enabled, or disabled, via a button on the front-panel. Multiple 340s can be set up in a multi-drop configuration to facilitate complex computer-controlled surveillance systems.

The receiver's IF gain can be varied by a Manual Gain control, with a maximum reduction of 120 dB. The IF gain reduction level is displayed in dB, next to the AGC speed, in the Auxiliary Parameters group.

❖ How does it play?

Now that we've gotten all the formalities out of the way, let's get down to brass tacks: how does this commercial receiver perform?

First, I must say, the internal speaker provided audio that was much better than expected. I think it's good enough to qualify as "good" – not Hi-Fi, but definitely better than expected. For my real world testing, though, I opted for an external speaker, as well as my 500-ft Loop Sky-Wire.

I'm always curious how these types of radios perform under 500 kHz. While most "ham" radios drastically reduce sensitivity in that frequency range, most commercial units incorporate only minor reductions, as they are designed more to maintain the same performance over the radio's entire frequency range. True to form, the 340 performed wonderfully in radio's "basement." The sharp, narrow bandwidths really help out when digging through the late-night clusters of beacons. If you come upon a beacon and can't find a combination of mode, bandwidth/PBT, and notch that digs it out of the interference, then it's probably going to take a whole lot more receiver to do it, if at all.

Now for the AM broadcast band. Performance was very nice, to say the least. I really enjoyed having the wider bandwidth capabili-

ties for strong stations with no adjacent channel interference. It was while listening to some of those stations, I noticed there were very short duration "pops" in the audio, but only on voice peaks. After checking multiple local stations, and hearing the same thing, I started experimenting with front-panel settings. It wasn't long before I found that the AGC was set to Fast, and when I switched it to Slow, the popping went away.

After experiencing the previous two bands, there was not much of a surprise when it came to shortwave. The same great performance was enjoyed throughout this part of the spectrum as well. I love these DSP radios, with their multitude of bandwidths; you can almost always find one that will do the trick. And, there are so many choices, you're usually able to reduce bandwidth just enough to eliminate the interference, yet maintain enough bandwidth for good readability.

❖ Final Thoughts

I'd be lying if I said I wouldn't like having a 340 at my station, but I'd also be lying if I said that there are no radios out there now that perform as good as, if not better, for less money. Those radios, however, are intended for the amateur radio market and probably wouldn't be suited in the commercial or military applications that the 340 was designed for. With the 340 and its technology now about 6 years old, I wonder if TenTec will release a "modern" version of the 340, perhaps the 340B; I don't think I'm the only one who would be eager to get one on the bench, to see if a new "standard of comparison" had been created.

The RX-340 is sold directly from the factory to customers in the U.S.A., Canada, and any country without a Ten-Tec dealer; MSRP is now $4,250. For more information, visit the TenTec website at **http://www.TenTec.com** or write Ten-Tec at 1185 Dolly Parton Parkway, Sevierville, TN 37862; 865-453-7172.

Table 2.

S-Meter Accuracy

Signal Level (dBm)	S-Meter (dBm)
-130	-127
-120	-117
-110	-107
-100	-97
-90	-91
-80	-81
-70	-72
-60	-62
-50	-53
-40	-43
-30	-34
-20	-24
-10	-14
0	-5

Words in Time: RecAll-Pro & ClocX

Whether it's in the form of voice or data, audio is a key to radio monitoring. And of similar importance is time, the fourth dimension. This month we'll look at two computer programs that really can assist in just about any form of radio monitoring by keeping track of these key monitoring parameters.

Record Anything

A few years ago we reviewed a program from Sagebrush Systems that allowed a computer to operate as a sound-operated audio recorder, just perfect for unattended monitoring. Today, Sagebrush offers RecAll-Pro, which does the unattended recording job with some nice additions.

Unchained from the Radio

How many times have you wanted to listen to a favorite radio program at a specific time, only to fall asleep or be called away? It happens to me all the time. Many "complete" monitor program suites have timers and audio recorders included. But if you just want a basic approach, maybe RecAll-Pro is worth trying.

All it takes is a PC with a soundcard running WinXP/98/95/NT4/ME/2000. I tried it on a Pentium II 433 MHz under Windows 98 and it ran without a problem.

Version 1.4 beta 12 is quite compact, weighing in at under 800kb including a detailed Help File. This makes it a quick download even using Internet dial-up. Once downloaded and run, the file installs itself in a quick effortless process.
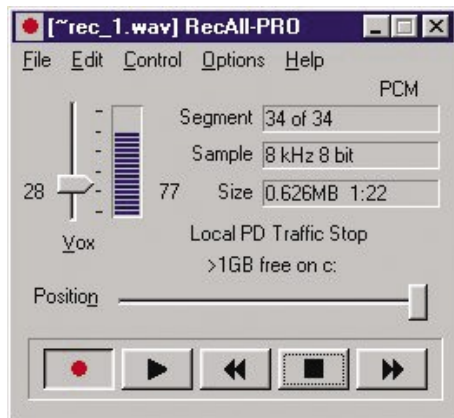
Figure 1 RecAll-Pro's deceptively simple main screen

Mixing It Up

The audio source can be either from the soundcard's microphone input or the Line-In jack. I titled a recent column, "I Hate Sound-Cards," but in the case of RecAll-Pro, setup is easy once you access your Mixer program. The program's Help file gives detailed instructions for this critical setup step. The audio input (Line-In in most radio applications) needs to be un-muted and its level adjusted to midrange. Read the Help file carefully and you should have no problem …but remember, I hate soundcards.

Don't Be Fooled

The main screen of RecAll-Pro is deceptively simple, as shown in Figure 1, but it has lots of capabilities. The Command Line at the top is the gateway to the program's features via the dropdown menus. The right side of the display is devoted to the details of the record file: Type (PCM), Size, Sample Rate, Size, File Segment and Label. At the left you can see the input audio signal level of 77 on the vertical bar graph.

Timing is Everything

RecAll-Pro can be programmed to start and stop at specific time. Figure 3 shows the two events that I programmed for recording.

Vox Populus

In Latin, "vox" is voice or sound, but it has long been an acronym for Voice Operated Transmit or Control. Don't ask me how they got the "x," but I can think of other places where "x" stands for omitted letters (rx, tx, etc). The slider control, situated to the left of the input signal bar graph, sets the VOX setting.

In Figure 1 the VOX slider control is set to 28. When an input signal exceeds 28 the program will begin recording the audio to the computer's hard drive. If we select the "Option" menu in the Command Line of the Main screen, then Preferences, and finally the VOX tab, Figure 2 results.

Made For Monitoring

The VOX menu is where we can set parameters near and dear to radio listeners hearts' such as recording delay after signal
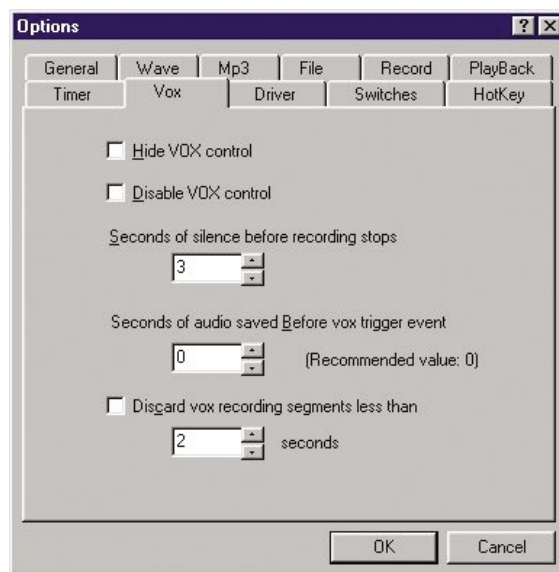
Figure 2 The VOX control display in the options menu

loss, which the RecAll-Pro calls "seconds of silence before recording stops." We have set this to 3 seconds.

Monitoring under conditions of short but strong noise pulses, can raise havoc with squelch and VOX circuits. In these situations the "Disregard VOX segments of less than __ seconds" really helps. This parameter filters out short noise pulses and stops them from being recorded.

Time Stamp

Replaying captured audio from a VHF/UHF scanner that has been doing its job for a few hours can be great fun. Knowing when the intercepts took place in time makes it even more enjoyable (and useful).

RecAll-Pro puts a time-stamp on each sound segment. This is displayed during playback. In the words of the Help file, "When sound goes below the recording threshold for a few seconds, RecAll stops recording. When sound is detected again, a new recording Segment is started with a new time-stamp."

Under The "Edit" Command Menu, the user can insert an annotation that is displayed during playback of a portion of the file. See Figure 1 for line which reads, "Local PD Traffic Stop." This annotation is displayed until the user inserts an "End Annotation" command. This feature is perfect for identifying intercepts for later review and sorting.
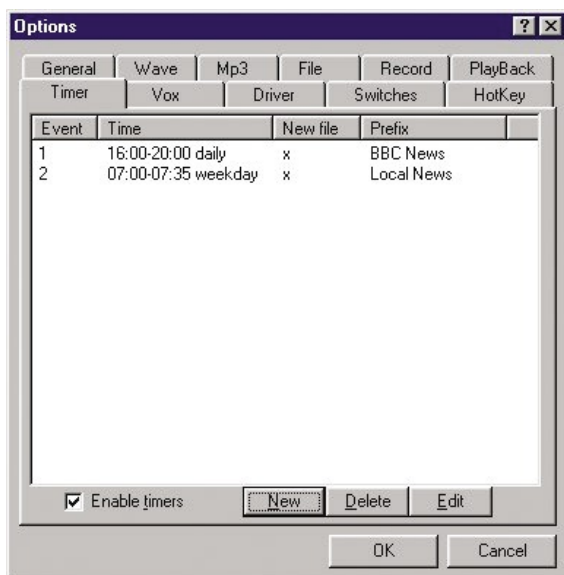
Figure 3 RecAll-Pro list of time-programmed recordings

Putting It All Together

Saved digitized audio can be manipulated using the programs Edit and Control features. RecAll-Pro allows the user to Cut-and-Paste and Drag-and-Drop audio segments. Using these features, captured-audio from different stations at random times can be grouped together. The result is uninterrupted audio from an unfolding "situation."

Audio files can be saved in either MP3 or Wave formats depending on your storage capacity and audio library preference. Parameters for each of these file types can be adjusted in the "Options" menu under the MP3 and Wave tabs.

Just Try It!

I think we have said enough on the RecAll-Pro. Just go to **http://www.sage-brush.com** and download a trial version of RecAll-Pro. The full version can be purchased on the website for $29.95. RecAll-Audio Capture, with fewer features, is also available for $14.95. Give them both a try. While you're at the SageBush site, check out their other interesting programs. We'll look at two of them in a future column.

❖ Back to Time: ClocX

As we said, knowing when intercepts took place in time makes listening more enjoyable and useful. In addition to audio being a key to monitoring, time is another key. Knowing the time, keeping a close watch on the time, having the computer sound an alarm at critical times, and activating monitoring programs can be helpful to radio monitors.

A free program, ClocX version 1.5 beta 1, displays an analog clock with a sweep second hand and some interesting alarm functions on your computer screen. ClocX works under Microsoft Windows 98/ME/NT/2000/XP on just about any PC.

The user can customize its position, appearance and alarms very simply. The top of Figure 4 shows ClocX with the date display activated. With its "Keep On Top" feature the clock will appear on all your screens, no matter what program is running. In this way you'll always be aware of the time.

Alarming Features

Right clicking on the "clock" brings up a menu. One of the menu's choices is "Options," where a number of program features can be customized. However, I was most impressed with the alarm functions as seen in the "Alarm" menus in Figure 4. Simple alarm functions include the ability to show an alarm window and play a sound. The user can customize the screen and sound. But it gets real interesting when you use the alarm's ability to execute a user-specified application and/or shut down the computer at programmed times and dates.

The left screen in Figure 4 displays all programmed alarms sorted by time. Check the box to the left of a specific alarm to activate it. Here we have only created three alarms of the many that are possible. Each of these three alarms has an "Alarm editor" screen associated with it. Details of the second alarm are shown in the "Alarm editor," the right screen in Figure 4.

In Figure 4 we see the alarm I set to remind me of a fictitious High Tech Program on the BBC at 2:15a.m. on Tuesdays and Thursdays. Also note from the right display that when the alarm sounds a screen will be displayed announcing "Time To Listen To BBC High Tech Program."

The last alarm that you can see in Figure 4's left screen shuts down the computer after the program ends. This is my bit for energy conservation and my electric bill.

Really Doing Something

Using the "Execute application" box and defining a program, the possibilities are limitless. Start monitoring programs. Activate audio/video recorders. Perhaps even email the florist to order flowers for your wife's birthday. As I said, the possibilities are limitless.

As we mentioned, many sophisticated monitoring programs include timer features, but ClocX is simple to use and will work well with just about any program. Download ClocX at **http://clocx.fi.cz/** for free. If you like it, donations are always welcomed.

❖ A Final Word

Malicious programs are everywhere on the Internet. So when downloading programs from the Internet, even from websites mentioned in this column, the use of an on-access protection program is highly recommended. A free one that does a very good job is "Avast!" available at **http://www.avast.com**. In the words of an old police TV program, "Be careful out there!"
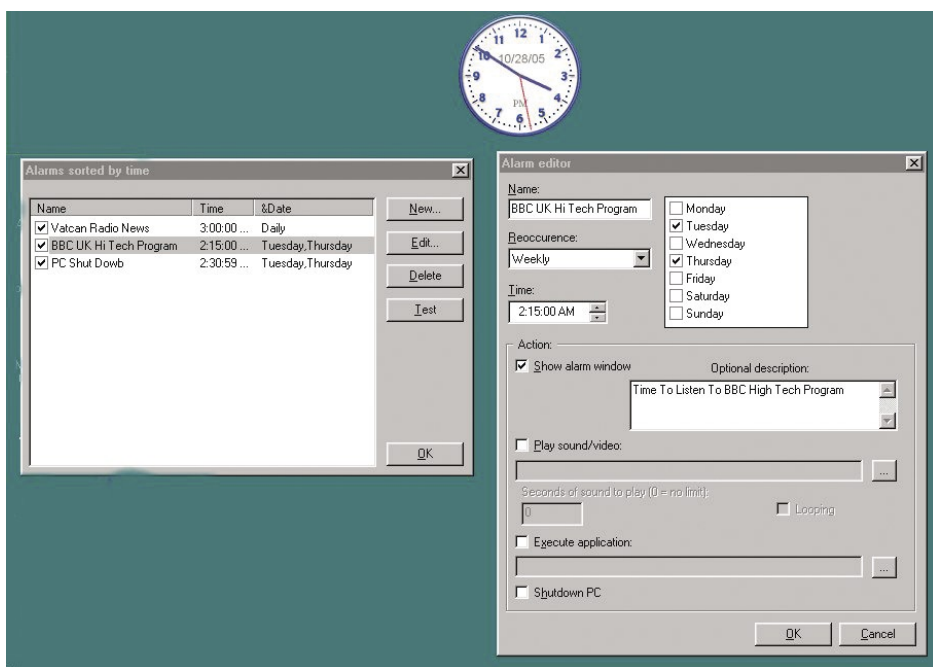
Figure 4 ClocX at the top displayed with its alarm set and sort screens

What's NEW

Tell them you saw it in Monitoring Times

Hot Satellite Reception

Are you tired of trudging out to your dish to chip off this winter's snow and ice build-up? Let the Ice Zapper satellite dish heater from Skyvision do the work for you. It installs on the rear of any small plastic or metal satellite dish with self-sticking adhesive and plugs into any outside electrical outlet to melt away snow and ice from your dish. The Ice Zapper is $69.95 from Skyvision 800-500-9275 or visit **http://www.skyvision.com**.
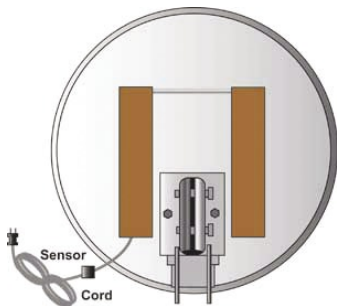
Basic Radio – Understanding the Key Building Blocks

By Joel R. Hallas, W1ZR

Whether you listen to short-wave radio, scanner communications, or you are new to the world of amateur radio communications, I am sure that a few of you have wanted to learn more about how your radio works. Answers to questions like, "How does a radio wave gets to us from a distant place?" or "How does the air-traffic controller know exactly where an airplane is flying and keep in constant contact with the captain flying that plane?"

Well, the ARRL has met an unfulfilled need in the radio hobby with the publication of their new book, *Basic Radio* by Joel R. Hallas, W1ZR. This is a basic book for everyone in the radio hobby, answering the "what" and "how" of radio communications.
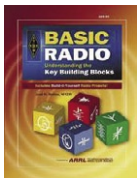
Basic Radio reveals the key building blocks of radio: receivers, transmitters, antennas, propagation and their application to telecommunications, radionavigation, and radiolocation. The book includes simple, build-it-yourself projects to turn theory into practice – helping reinforce key subject matter.

Basic Radio brings the magic of radio to life! It builds upon knowledge of elementary electronic concepts as presented in another ARRL publication *Understanding Basic Electronics*. This book provides the foundation in radio theory and practice necessary for anyone undertaking more advanced topics such as those presented in *The ARRL Handbook for Radio Communications*.

This 256 page large format illustrated book is published by American Radio Relay League (ARRL). *Basic Radio* is ARRL book #9558 and costs $29.95 plus shipping.

ARES Field Resources Manual

Last year will long be remembered as the year of the natural disasters, and amateur radio operators were in the forefront of communications in almost every one, from the hurricanes on the Gulf Coast and Florida to the tsunami in Indonesia.

If you are active in amateur emergency communications or if you want to be prepared for any communications emergency that may occur in your area, a new publication from the ARRL is a "must buy" for your shack or mobile operation – the *ARES Field Resources Manual*.

This manual is intended to serve as a quick trainer and field resource guide for the emergency communicator. It is a reference for amateurs deployed in the field for emergency services work, primarily through the Amateur Radio Emergency Service® (ARES®). It provides basic program information, forms, operating aids, and templates to be customized for the local area to include reference information such as important phone numbers, emergency frequencies, maps, organizational details, and more.
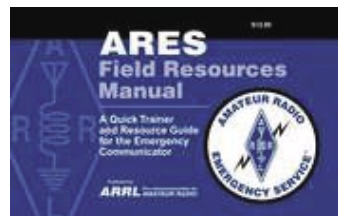
The *ARES Field Resources Manual* is a compact 92-page, spiral-bound publication. It is published by the American Radio Relay League (Book #5439) and sells for $12.95 plus shipping.

You can order the *Basic Radio* book or the *ARES Field Resources Manual* or any other League publication online at **http://www.arrl.org,** or on their toll free order line at 1-800-277-5289. The snail mail address is ARRL, 225 Main Street, Newington, CT 06111-1494.

FM Atlas

By Bruce F. Elving, Ph.D.

It started out 34 years ago as the *FM Station Atlas*. Bruce Elving published his project in 1971 while he was living in Milwaukee, Wisconsin. Through the years the size and coverage of the *FM Atlas* have increased, just as FM itself has become more popular. FM now accounts for over-three quarters of all radio listening in the United States.

And now the new *FM Atlas: A Guide for Travelers, Hi-Fi Listeners, Media People and Hobbyists,* 20th edition has been released. This new edition is bigger and better than ever – 264 pages of all the latest material you have come to expect from Bruce Elving's FM broadcast books and publications. The maps of FM stations are now computer-generated, along with FM broadcast station directories organized by both frequency and geography.

The *FM Atlas* lists program formats, stations that broadcast in stereo, as well as those suffering from the disease of being monophonic. The *FM Atlas* also shows FM translators and booster stations, and any FM subcarriers in use for each station.

Editorial features include a caveat about so-called "HD Radio." Digital audio broadcasting may limit your ability to tune in low power FM stations, small religious and college stations, and certain FM translators.

Whether you are a DXer, traveler, stereo enthusiast or in the FM broadcast media, you should not be without a current copy of the *FM Atlas*.

You can order the new 20th edition for $19.99 plus $2.05 shipping and handling using your American Express, VISA, MasterCard or PayPal by phone (218) 879-7676 or toll-fee at 1-800-605-2219. Or mail to FM Atlas, PO Box 336, Esko MN 55733-0336, USA or email your orders to **FmAtlas@aol.com**.

Bruce also publishes the *FMedia!* monthly newsletter, which is a "must" for updating the *FM Atlas* book. It has official news as well as chit-chat about the medium of FM radio. It covers facilities and call letter changes, format and stereo updates, and slogans or "nonIDs" in use, as well as new stations about to come on the air. There's news about emerging technologies like digital audio broadcasting and low power FM. It's a lively, information-packed newsletter at $75.00 per year for broadcasters, $26.00 per year for hobbyists, retired people or students. Sample copies $4.50.

You can find more information on the *FM Atlas* and *FMedia!* on Bruce's website at **http://members.aol.com/fmatlas/**. And while you are checking out Bruce's website, be sure to stop by his informative FM DX webpage (.../fmatlas/home2.html) and learn how to hear distant (beyond line of sight) FM broadcast transmissions.

– Book reviews by Larry Van Horn
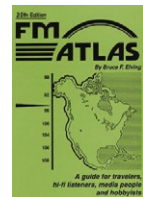
Stock Exchange

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Attention all those wanting to know what's going on with ham radio in the New Orleans area, check out: **http://groups.yahoo.com/group/GNOAmateurRadio/**

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E1XM $500*

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_ Headphone jack
_ Built-In Antenna: telescopic antenna for AM, FM and Shortwave reception
_ External Antenna Connection for the addition of auxiliary antennas
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_ Power Source: 4 "D" Batteries (not included); AC Adapter (included)
_ Dimensions: 13"W x 7-1/2"H x 2-1/2"D
_ Weight: 4 lb 3 oz.

E5 $150*

AM/FM/Shortwave Radio

The E5 is the world's leading multi-band and Single Side Band (SSB) enabled radio, uniting performance and mobility into one compact unit, and bringing the power of local and world radio into the palm of your hand.

Features
_ FM-Stereo, AM and full-Shortwave coverage (1711-29999 KHz)
_ PLL dual conversion AM/SW circuitry with SSB
_ 700 programmable memory presets with memory scan and auto tuning storage (ATS)
_ Clock, sleep timer and alarm functions with world zone settings
_ Tunes via auto-scan, manual-scan, direct key-in entry and tuning knob
_ Internally recharges Ni-MH batteries
_ Station name input
_ Dimensions: 6-5/8"W x 4-1/8"H x 1-1/8"D
_ Weight: 12.2 oz.

Features are subject to change

E10 $130*

AM/FM/Shortwave Radio

Intelligence meets performance in the E10. With 550 programmable memories, manual and auto scan, precision tuning and alarm clock features, the E10 provides the sophisticated tools for listening to news, sports, and music from around the world. The E10 even allows internal recharging of its Ni-MH batteries (charger and batteries included). With excellent AM, FM, and Shortwave reception, intermediate frequency shift and shortwave antenna trimmer—the E10 gives you the performance you want with the digital ease you deserve.

Features
_ Shortwave range of 1711 – 29,999 KHz
_ 550 programmable memories with memory page customization
_ Manual and auto scan, direct keypad frequency entry, ATS
_ Clock with alarm, sleep timer, and snooze functions
_ Earphones
_ Supplementary wire antenna
_ Power Source: 4 AA Batteries (included) or AC Adapter/Charger (included)
_ Dimensions: 7-1/2"W x 4-1/2"H x 1-1/2"D
_ Weight: 1 lb. 1oz.

E100 $100*

AM/FM/Shortwave Radio

The E100 fits full-sized features into your palm or pocket. This little marvel is packed with all the latest radio features you want: digital tuning, 200 programmable memories, digital clock and alarm, plus AM/FM and Shortwave reception. And, it is small enough to fit in your coat pocket.

Features
_ Shortwave range of 1711 – 29,999 KHz
_ 200 programmable memories
_ Memory page customization
_ Manual and auto scan, direct keypad frequency entry
_ Earphones
_ Power Source: 2 AA Batteries (included) or AC Adapter (not included)
_ Dimensions: 5"W x 3"H x 1-1/4"D
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